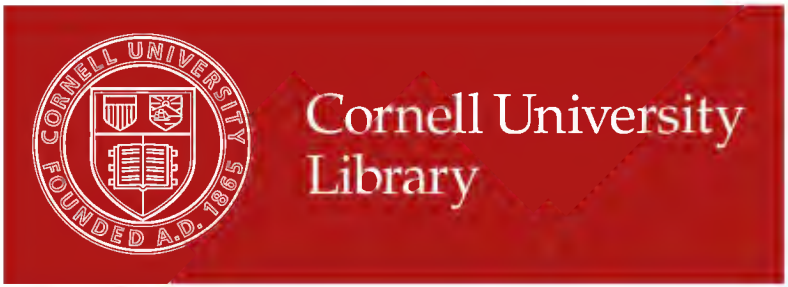

UNITED STATES FOOD ADMINISTRATION

Ten Lessons on Food Conservation

Lessons 1 to 10

WASHINGTON, D. C.
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TEN LESSONS ON FOOD CONSERVATION ARRANGED FOR SUMMER SCHOOLS.

The purpose of the course is threefold. The first aim is to acquaint students in the country with the world situation. Food shortage, which is so serious as to necessitate the creation of machinery for food administration, is especially emphasized. Tentative plans for the organization of this department are given. Lesson I covers this ground.

Second, the course is designed to tell students definite and immediate things to do, and wherever possible show how to do them. This work is already well under way in many States, so that Lessons II to IX, inclusive, reenforce and reiterate what in many cases the local people are already doing.

These lessons are given in outline form, and are meant to be suggestive only. In many instances they will have to be changed, rearranged, and regrouped to meet local conditions.

The third and last aspect of the course, as stated in Lesson X, deals with the use to which this material is to be put. Each person who takes this course on food conservation should be requested to acquaint the family with the urgency of the situation, and to ask them to carry out the suggestions made by the food conservation department through whatever local arrangements have been made. As these will vary greatly, this office can only suggest possible types of local organization.

TEN LESSONS ON FOOD CONSERVATION.

COURSE FOR SUMMER SCHOOLS.

I. Part 1. Food the Deciding Factor.
Part 2. Plan of Food Administration:
Organization for food conservation.
Federal.
State.
Local.

II. Food Conservation Measures.
Use local foodstuffs.
Use perishables.
Elimination of waste.
Conservation of wheat.
Conservation of fats, sugars, meats.
Preservation of perishable foods.
Adequate feeding for health.

III–IV. Wheat Conservation: Demonstrations of emergency breads.

V. Conservation of Meat.

VI. Conservation of Fats and Sugars.

VII. Food Preservation: Demonstration of canning.

VIII. Food Preservation: Demonstration of drying.

IX. Fundamentals of an Adequate Diet: Adults, children, infants.

X. Methods of Organizing Local Groups into a Working Unit.

LESSON I.

PART 1.

FOOD THE DECIDING FACTOR.

To make the world safe for democracy we must win this war. The three factors which will shape and determine its issue are money, men, and food. We are spending money in unlimited sums. We are reverently dedicating to the battle for free government the lives of our young men. Money and men can be obtained through organization, and as a nation we have demonstrated our ability to organize. But the task facing the American nation is harder than that of organizing and equipping effective armies; it is to modify the food habits of the 100,000,000 of our people so that the needed increased supplies of food may be furnished. Only through cooperation, in which as a nation we have had little experience, can we accomplish this.

Thoroughgoing cooperation is now imposed on the American people, because this year there is not enough food in the world for the world's needs. This is the fact, whether the war be long or short and regardless of its outcome.

Our allies must have more food than they can raise, and we must send them more than we can readily spare. To do this requires a few definite changes in our daily habits, and they can easily be made. Neither producers nor dealers nor consumers can effect this alone. The women who administer our households can not bring it about. It can not be done by legislation. Only by cooperation, universal, generous, whole-souled, decisive, can we do it. This cooperation must begin in the home. Housewife, father, and children are equally concerned and equally under obligation to enter the partnership. The outcome of the war and the welfare of the world depend upon their actively participating with others in this program.

Why is the great issue of success or failure in this war dependent on the United States. What causes brought about this universal shortage of food?

First. Unkindness of nature. Late springs, droughts, hurricanes, poor conditions of rainfall, unexpected frosts, and periods of intense heat have played havoc with crops the world over. The season of 1916 will go down as one of the worst seasons in agricultural history. Our own crop of winter wheat is below normal. Argentina, normally an exporting country, claims to have barely enough wheat for her own needs.

Second. Reduced productivity of the soil in Europe. This condition has been brought about by bad management, unskilled work, and lack of fertilizers; and these in turn can be explained by the withdrawal of men from farm and field to army and factory, and the employment on the soil of overworked women, unskilled old men, and listless prisoners. Furthermore the vicious submarine has sunk boat after boat filled with nitrates and fertilizers, conspiring to augment the pauperization of the

earth, so that reduction in soil productivity was inevitable. For three years the world has been engaged in a ghastly competition of destruction and the soil is now beginning to take its revenge.

Such depletion in food supplies as these causes have brought about has made of food conservation an imperative necessity. One striking example of this is seen in the fact that in Germany to-day no food is fried. It is all boiled or stewed. Grease from the kitchen sink is carefully treasured, and soap, the basis of which is edible fat, has become a luxury of millionaires. Candles, another fat product, have disappeared. France and England also lack fats, though in a lesser degree, and unless the women of America realize the extreme importance of not wasting and of not consuming one unnecessary bit of butter or other animal fat, we may later be in the same predicament.

But the problem of food production and conservation, and the necessity for a food administration to deal with it would have arisen whether we entered the war or not. The nations of Europe that are now our allies have always been large importers of our foodstuffs. Because of their absorption in hostilities during the last three years they have been forced to buy from us an ever-increasing proportion of their foodstuffs. This demand must inevitably have grown more pressing and our own spare resources as events progressed would inevitably have been exhausted.

Nor would the coming of peace solve the food problem. Most people are under the dangerous delusion that the mere ceasing of the firing of the big guns would bring bread to the world's table. That idea must be banished. It is essential that the nation should realize the permanency of our food problem. Peace, so far as we are concerned, means that to the demands of those who are now our allies would be added the demands of those who are now our enemies. We could not be indifferent to their hunger and so our diminished stores would be still more rapidly depleted.

Why, then, if food exhaustion is so universal, may we not rely on the speedy collapse of Germany's resistance? The answer is that before the war Germany and her allies were almost four-fifths self-supporting, whereas England was only one-fifth, France one-half, and Italy, at an optimistic estimate, perhaps two-thirds. Germany, moreover, was a nation given to over-eating. The reduction of her rations was at first a benefit rather than a detriment to her population. Although in the last two years she has suffered severely her problem from the beginning has been only to increase her production by approximately 25 per cent. In spite of bad harvest she seems to have been able at least to meet the emergency, and if reports do not falsify she can do so indefinitely. She has possessed herself of what used to be the western fringe of Russia. She is cultivating much of Belgium and a large acreage of northern France. Her latest conquest of Roumania has given her possession of the plains around the lower Danube, perhaps the most fertile soil in the world. Further, Germany has a tremenduous and intricate food organization and no one within her borders dares to waste a crumb. Considering all these facts it would be the height of folly for America to assume anything less than Germany's power to endure.

The position of our allies in western Europe is essentially different. Dependent, even in peace times, on importations from the outside they drew their foodstuffs from almost every other country in the world. They can not now get supplies from central Europe—Germany, Austria-

Hungary, Bulgaria, and Turkey—with which they are at war. Neither can they obtain grain from Roumania nor from Russia. With the best will in the world to aid, and presumably large stores of foodstuffs to sell, Russia is handicapped by the disorganization of her railroads. Even before the revolution her transportation system was paralyzed. To correct these conditions overnight is impossible. There will have to be a national rehabilitation before the allies can reasonably hope for help from their great free friend of the East. India and Australia, too, can send but a part of their surplus to England or France because of the shortage of tonnage caused by the depredations of the submarines. Furthermore, the long trip from these far countries to the home ports is uneconomical and wasteful at a time when every inch of cargo space and every hour of cargo time has to be conserved. Nor can help be looked for from the great food-producing nations of South America, for they also have shared in the general crop depression, and it is doubtful if they will have enough even for themselves.

The United States is the greatest food-producing country. We have a larger acreage of land in crops than any other nation, except perhaps China. This acreage is nearly equal to that of all Europe, excluding Russia. For the moment Russia's crops count only for herself. From all this it will be clear that what our allies need from us in the way of cereals for human and animal food is enormous. Their total requirements are nearly 1,000,000,000 bushels. Of this amount native production and imports from other countries can supply but a small part; most of it must come from us. Yet this amount is far beyond any surplus that we shall have if we keep up our usual eating habits. We have never exported more than 500,000,000 bushels of cereals in a year, yet the needs abroad call for nearly twice that.

The moral is clear. We must reduce our own consumption. Our highest obligation in this war is to make sure that we do not fail our allies in their hour of need, just as our deepest duty to ourselves is to plan to-day, intelligently and patriotically, to provide against the possible shortage of next spring. It is within our power not only to protect ourselves and to create a surplus big enough to meet the most pressing needs of these peoples if we enforce on ourselves a few minor economies. Already our allies have sacrificed their bravest and best for the cause which is now our cause. Their sacrifices must go on, but they must not be allowed also to starve. However generous our giving, this summer and fall there confronts France and England and Italy the blackest and most agonizing winter they have ever had to endure. Such minor deprivations as we may suffer seem petty in comparison. Regulate ourselves we must if only to keep them in the trenches and to avert high prices, discontent, and general business and industrial depression in America this winter and next spring. Loyalty to those whose cause we have espoused and duty to ourselves counsel and oblige us to economy.

There is no suggestion of dictation in this appeal. The economies outlined impose no hardships. All must do their bit, but in applying the measures our nation's chief reliance must be on the women. They have the direction of the households of the land. In this, as in all wars, their great service is the all-important task of food conservation.

We would be blind to hard facts if we were not aware that many women throughout America, in the face of present high prices, regard the demand upon them for new economies as something of an impertinence. "How can you ask us to economize," many of them will say, "when already we

have not enough money to buy things necessary to support life? What we want to know is not how we can cut down the amount of food, but how we can increase it."

To this just criticism it should be said plainly that the projected food administration will take definite measures to do away with food speculation where it may have existed, and to stabilize prices at fair levels. But new economies must also be pointed out so that the whole people can extend the purchasing power of a dollar.

At the moment there is no actual shortage of foodstuffs in this country if we were only to feed ourselves. We have more than enough to feed ourselves; a great deal more. The terrific uplift in prices is due to the world's demand on our food surplus, the actual size of which is smaller than ever before in the history of our country. This has been, of course, an incentive to speculation and the advance has come about because of the haphazard way in which buyers have bid against each other until they raised the prices sky-high.

Under the new food-control régime it is hoped that prices can be kept from going higher if they are not reduced. It would be a serious error to suppose that any decrease in prices means any lessening in the need for saving and of economizing. In most European countries the Governments are dictating daily food rations for their inhabitants. The question of high or low prices must not blur our vision of the basic economic realities beneath. It is a matter of general supply. Put simply, it means that no matter how low prices may go nor how high they may reach, the real problem is, Can we produce enough for ourselves and enough more to make up the deficiency of our allies?

We can if we so desire. Autocracy believes we can not do it; believes that as members of a democracy we are too selfishly individualistic to desire it, too weak to accomplish it even if we did wish it. It admits our fighting ability but derides our power of self-control and self-sacrifice. Apart then from our obligation to the allies, it is incumbent on America to prove that democracy needs no tyrant's rod to govern its ways or its appetites. We have already undertaken broad measures to increase our production of food, and our intelligence, our sense of value, of the object to be accomplished will inspire us to decrease our consumption. We shall be saving for victory.

In a sense the United States is taking part in a great cooperative experiment. It has entered the family of nations. It has assumed tremendous responsibilities. Its allies are dependent on it and expect high performance from it. Yet unless we practice among ourselves what are no more than a few minor deprivations, western civilization can not go on. It may be reiterated once more that the necessity for these economics is actually independent of any political or military events which may supervene in the immediate future. The world crisis compels them.

In conclusion let us again define the situation that confronts us, so we may realize how great is the task to which we have pledged our honor and our faith.

Take the basic food of the world—wheat. It seems probable that all that we now have plus what we can raise this year plus the Canadian crop will amount to about 1,000,000,000 bushels. We and Canada would ordinarily eat half of that. We need to save in addition seed for next year and a small safety margin. This brings our joint total needs up to 700,000,000 bushels, and leaves 300,000,000 for export. The imperative needs of our allies in addition to what they raise themselves are just

twice that amount. The problem then is to to meet the difference between the 600,000,000 bushels that they need and the 300,000,000 bushels that we have to send them.

Perhaps it will be more comprehensible if we drop the terms of bushels and express the problem in units, assuming that every unit represents 10,000,000 bushels of wheat. On that basis we and Canada together have 100 units of wheat. We need 70 units for ourselves and so can spare 30 units. But our allies need 60 units of wheat. The problem then is to make the 30 units that we can spare fit their need for 60 units.

The only solution then lies in sharing the inescapable privations and sacrifices. We know that we have 30 units to spare, and it may be that by sacrifice and economy we can increase that to 45 units. Our allies need 60 units, but it may be that by sacrifice and economy they can get along on 45. The present prospects are that in any event 5 units of wheat will be sunk by the submarines, but that we must try to avoid. Our immediate duty is to save and send over seas 450,000,000 bushels of wheat, when we have only two-thirds of that amount to spare. If each of us should eat three and one-half slices of bread for every five slices we each have been accustomed to, the desired result would be achieved, the victorious conclusion of the war would be assured, and tens of thousands of deaths from starvation would be avoided.

PART 2.

PLAN OF UNITED STATES FOOD ADMINISTRATION.

To aid the American people in this great task of conservation, an office of food administration has been organized in Washington. It is under the direction of Herbert Hoover. It is to be specifically charged with the duties of carrying out the mandates of Congress in regulating supplies and managing a national campaign of food saving.

This business of food administration falls into four great branches—first, the control of our exports; second, the instrumentalities set up in an endeavor to regulate trade to the exclusion of both legitimate and illegitimate speculation; third, the mobilization of the women and men of the country engaged in personal distribution as actual members of the food administration to carry out, so far as their circumstances permit, the advice and directions which they are given toward national conservation; fourth, the erection in every State in the Union of some form of food administration which shall perform its own functions, but under the general direction and with the cooperation of the central bureau.

Execution of this program involves the restrictions of the export of foodstuffs to the degree that will leave us a proper supply for our own people, lest we be left next year with empty granaries.

By the elimination of speculation in foodstuffs their prices should be stabilized. Through systems of fair and even distribution the high cost of living ought to be reduced.

Mobilizing an army of food savers means creating organizations to carry information about the universal food crisis to the American people, and to instruct them how and what to eat so that the available supply may meet our own and our allies' necessities.

The colossal task of enlisting the cooperation in this food program of every man, woman, and child in the United States requires the services of great corps of volunteer aides, who must themselves be familiarized with

the problem and the details of the campaign so they may carry the message to their neighbors. For this purpose a conservation department has been established by the food administration as head information center for the country. This department will gather the facts and material and communicate through its own representatives with the great system of State organizations that the emergency has already called into being. In other words, this Washington office will be general staff headquarters, wherein the food campaign will be mapped out and ammunition collected for the direction and use of the armies in the 48 State fields.

We are not concerned here with the methods by which the administration proposes to control exports or to exclude gambling in foodstuffs. It is the purpose to act through the ordinary distributing agencies in the community, enforcing only such restrictions against hoarding, speculation, and waste as the legitimate distributor may meet with a minimum sacrifice. It may be said that Mr. Hoover anticipates but little difficulty in persuading our powerful food organizations of the propriety of subordinating their individual interests to the all-pervading public necessity. So far his negotiations have been met in so fine and patriotic a spirit of compliance that it is improbable he will have to use any of the special powers with which the new law may equip him.

The purpose of this lecture is partly to acquaint you with the great international facts about the world food crisis, the steps our Government has taken to meet it, and the system by which it is proposed to organize our 100,000,000 people into an army of food savers. Especially do we hope to enlist each of you in the campaign as a volunteer assistant of the food administration. Through your relations with your own communities you are especially fitted to organize your neighbors and friends and the parents of the school children into regiments pledged to cooperate in the great work that is before us. Also you can organize informal local study classes in which knowledge of the facts of food conservation and the ways and means of following the administration program may be set forth. Just how you may best go about this work shall be fully outlined hereafter.

President Wilson in his letter to Mr. Hoover says:

> The women of the Nation are already earnestly seeking to do their part in this, our great struggle for the maintenance of our national ideals, and in no direction can they so greatly assist as by enlisting in the service of the food administration and cheerfully accepting its direction and advice. By so doing they will increase the surplus of food available for our own army and for exports to the allies. To provide adequate supplies for the coming year is of absolute vital importance to the conduct of this war, and without a very conscientious elimination of waste and a very strict economy in our food consumption, we can not hope to fulfill this primary duty.

It is, then, the women of America, whose patriotism is thus so eloquently appealed to by our President who must be gathered to the standard of food conservation. It is they who purchase and handle the food of the nation and their cooperation is essential to the success of this campaign. You must persuade them first of the necessity for saving and of their own responsibility to do their part toward winning the war, and then instruct them as to the ways and means by which they shall economize. It should be made clear that nothing drastic is contemplated. As Mr. Hoover has put it: "The American people should eat plenty, but wisely and without waste." The set of cardinal principles that the food administration has formulated afford specific directions with which it is easy to comply. No great hardship is imposed by the injunction of a wheatless meal or of

using beef or mutton not more than once a day. Observance of these and the other injunctions may all be to the pecuniary advantage of the individual housewife and if she is truly inspired with the wisdom as well as the necessity of complying with them, you will gain whole-hearted cooperation. Apart from the patriotism involved in joining this national movement you must not forget the excellent argument that the universal regulation of food supplies and prices instituted under the food administration will inevitably keep the present price from climbing higher and may reduce to normal the swollen prices of the common necessities of life which are now burdening the community. Do not forget that in the food-controlled countries of Europe the average prices of many commodities are lower than at home. Even the dullest will grasp the bearing of these crucial facts on their own situation.

So the proposed system of organization may be perfectly clear to all who expect to participate in it. We repeat that it consists of a central office in Washington, related to and working through to the people by means of its own representatives and of State administrations in every State in the Union. The central office is the national center for direction and instruction, and furthermore, it is connected directly with every member of the food army by the individual food pledge which is mailed to and filed in the administration archives in Washington. On receipt of this pledge there is mailed from the bureau a household tag bearing the insignia of the food administration, together with a card setting forth the cardinal principles of economy, which the signer has agreed to follow.

On the State organizations devolve, first, the task of carrying the message of the national need of conservation to the individual woman, and if she has not already done so securing her signature to the United States Food Administration pledge. Thus enlisted the State food administrations must next proceed to train her how to serve the cause. This involves keeping in touch with every housewife pledged to the food administration so that she may be held firm to her agreement and inspired to enthusiasm in enforcing its rules within her household.

The execution of a program of this magnitude will require the aid of all existing social, fraternal, and business associations that may be pressed into service and many others to be created later. The public-school system of every community with its troops of instructors trained to impart ideas must be enlisted to further the work. The immense influence of the church and its kindred organizations will prove a powerful factor in the crusade. Through all these bodies with their innumerable ramifications it should be possible to reach the mind and heart of every woman in the country and convert her to willing compliance with the administration's requests.

Each State administration will be expected to secure the cooperation of all such organizations and agencies in its work. It must coordinate their activities to prevent overlapping, adjust the national food program to meet local conditions, and be the center of information on food conservation for its own territory.

Responsibility for enlisting and directing this great work of organization has been undertaken in the various States by the State council of defense or similar official organizations. These will be coordinated with the State agricultural college and its extension service and the State agricultural department, and will be related through the State Federal food administrator with the food administration at Washington.

Each State food administration will include an official woman leader, an authority on home economics, who will especially devote herself to the interests of the home.

Once under way these organizations will begin vigorous campaigns of education. Agents specially versed in home economics will be detailed to aid and instruct local bodies. Every known device to focus and engage continually the attention of communities and individuals upon food conservation will be used. Lectures will be instituted and food exhibits and demonstrations arranged. The gospel of economy will be preached throughout America in unforgetable terms and our people will derive from it all a knowledge of food products and a skill in their utilization that will in the end recoup all the billions the war will cost.

LESSON II.

OUTLINE.

FOOD CONSERVATION MEASURES.

I. USE LOCAL FOODSTUFFS.

(NOTE.—Study your local conditions and select groups for illustrative material.)

Reason.—Reduce congestion of transportation. (Insert data on difficulties in transportation.)

II. USE PERISHABLES TO CONSERVE STAPLES:

Garden products.—Can safely double amount ordinarily used.

Orchard products.—Use large amounts of fruits, fresh and preserved.

Dairy products.—Use more whole milk, skim milk, buttermilk, cottage cheese. Milk is a cheap source of superior protein, therefore it is best for growth and repair.

Poultry products.—Use eggs as far as possible. Preserve eggs and can cockerels and fowls for future use.

III. ELIMINATE WASTE:

(1) Define *waste* as failure to use food materials to the best advantage.

(2) (*a*) Transportation. Hence use local supply.
(*b*) Improper handling in home.
(*c*) Poor meal planning.
(*d*) Preparation.
(*e*) Cooking.
(*f*) Careless service—i. e., individual plate waste.

IV. WHEAT CONSERVATION:

(1) Need to reduce by 25 per cent our present consumption of wheat.

(*a*) *Method.*—Stretch the wheat supply from 10 per cent to 25 per cent in bread making through use of corn meal and other cereals with wheat flour.

(*b*) *Method.*—Use other cereal products in place of wheat products.

(1) Breakfast foods.
(2) Quick breads and cakes.
(3) Soups and made dishes.
(4) Desserts.

(*c*) *Method.*—Increase use of vegetables and fruits to reduce use of bread.

V. FOOD PRESERVATION: Conserve perishable fruits and vegetables to prevent waste, lessen use of staples, and increase variety in diet.

VI. AN ADEQUATE DIET AND ITS IMPORTANCE.

VII. WORKING PROGRAM.

USE LOCAL FOODSTUFFS.

An increasing demand for the transportation of supplies connected with the war has interrupted the usual transfer of foodstuffs between different sections of the country, and this puts upon every family the patriotic necessity of increasing as far as feasible the use of foodstuffs produced locally. The national food administration will therefore undertake as one of its important services the study of the food supply of the different States and local food zones, and the food habits of the people so as to increase the use of local foodstuffs and at the same time disturb as little as possible their accustomed ways of living. Therefore, use local vegetables and fruits and those from near-by sources rather than those transported long distances. This means "use in season." Similarly, use local cereals, meats, and other foodstuffs as far as possible. This can be done with the food program advocated while still providing an adequate and sufficient diet for bodily health.

USE PERISHABLES TO CONSERVE STAPLES.

As a result of the whole-hearted response to the plea for increased planting of home gardens the country is facing a probable surplus of perishable material. Unless we can adjust our dietary habits so as to utilize this present crop, it will be difficult in the future to induce people to respond to "Plant the backyard" slogan; but we can adjust our dietary and eat more perishable foods. Extended study of our food habits has shown that we use fruit and vegetables to supply only about 14 per cent of the heat requirements of the body. Experience has shown that much larger quantities can be used and that a diet containing an abundance of vegetables and fruits can be made attractive. Rightly prepared it is wholesome as well. We can easily increase the amount of fruit and vegetables to make up this difference. With our increased acreage in potatoes, if the harvest equals the apparent prospects, we should be able to increase the daily use of potatoes 4 ounces per individual per day. This means practically the wider use of tried and attractive potato dishes and their service at an additional meal a day. Even this increase would bring the American diet only to the point at which it is about one-third vegetable.

The orchard products in many localities promise record yield. The more we can use daily, either fresh or cooked, to good advantage the better. The surplus should be preserved, either through canning or drying, in this way insuring a wider range in the winter supplies with a lessened demand upon our store of staples. Forty-five per cent of our population live in the country and small towns, and if they, during the months of July, August, and September, would use more perishable products from the farm and garden, the saving in staples, such as cereals, could be greatly increased.

The tendency in the increased cost of cattle feed has been to raise the price of milk. In consequence in some localities the amount of milk used has been reduced, with a resulting injury to the growth of the child and to the health of the adult. If we have learned one thing from European conditions, it is that we can better afford to cut down on almost any other food than on milk, especially whole milk and its products. For the child milk is the chief source of a nearly perfect muscle-building food. It is rich in easily digested fats and it contains materials which stimulate

growth. Every effort should be made to preserve and to increase rather than diminish the dairy herds of this country. We should use more and more of whole milk, skim milk, buttermilk, and cheese.

ELIMINATE WASTE.

While most of us are careful to utilize to the fullest extent all food supplies, we must remember that there are other kinds of waste than that which comes through the lack of care in the kitchen. Waste at the point of production through careless handling, waste in transportation, due to poor methods of cartage or inadequate routing to its destination, will account for a great deal of the waste of our American foodstuffs. Lack of proper care in the home increases waste, which is large in proportion to the home food supply and yet readily controllable. Screening to keep out flies, ice boxes, food safes, protection from dust and germs, and cooking before food spoils are all important. Moreover we must not forget that in our homes we must still reckon with waste through poor preparation of food for cooking, waste through careless methods of cooking, and finally, waste through too generous servings on individual plates. We need not only a return to an older convention which taught that it was impolite to leave food upon the plate, but we need a new commandment—to wit, that to-day it is criminal to take more than we intend to eat. Our first carelessness may be measured by the statement that those companies which contracted to purchase garbage counted for their profit upon the fact that every ton of household waste would yield from 35 to 40 pounds of fat over and above the residue that could be used as fertilizer.

We need to realize that in the present emergency the wise use of food which has been legitimately discarded in the home is sufficiently important to make it worthy of detailed study. A zone map will be made of the State to determine to what extent garbage should be utilized for the recovery of fat, or if, as the Germans are doing, it should be used to feed stock. In the latter case the women of the country must aid in the careful saving of that portion of household waste that may be used as food for the lower animals.

WHEAT CONSERVATION.

Over 40 per cent of all the heat units we need is furnished through our liberal use of cereals. Of this 40 per cent, seven-tenths is furnished by wheat alone. With the need to conserve the wheat supply we must advocate not reduction in the use of bread, but the decreased use of wheat in making bread. If we could decrease our individual use of pure wheat bread so as to save 2½ ounces of wheat per day per capita, we would be able to do our part in furnishing the needed cereals for our allies. The South, which uses other grains than wheat for her breadstuffs, furnishes an example for the whole nation. The North and West should decrease their use of wheat more nearly to the standard of the 30,000,000 people of the South.

FOOD PRESERVATION.

So much intensive work has already been done along the line of canning and drying perishable fruits and vegetables that it is necessary here only to mention it as part of the general plan for food conservation. It will be discussed in detail later in the course.

ADEQUATE FEEDING FOR OUR NEEDS.

Any program for food conservation which does not have its basis in sound principles of human nutrition is doomed to failure. Intensive study of European experience in food conservation during the war is being made by the nutrition experts of the country. A working program will soon be available. The main principles will be discussed in one of the lessons of this course, but we must not make the mistake of assuming that the food habits of a people can be changed quickly or materially, or that one group of people must necessarily be fed in the same way or with the same food supply as any other group. The problem is much more complex.

WORKING PROGRAM.

1. Save all foods left from general table service. (Serve as soup, salad, stews, or scalloped dishes. One town reduced garbage collections over 40 per cent without any concerted effort of the people. Concerted effort may do much more. Saving on waste may help to pay the war debt.)
2. Save through serving smaller rolls, muffins, cuts of butter and meat, thus allowing each person to ask for second helping.
3. Save by using all you produce and all you purchase.
4. Save through use of little-used portions of foods. Example: Leaves of vegetables for greens or salads or soups.
5. Save through using the most abundant foodstuffs as far as adequate diet permits.
6. Serve fewer courses and fewer dishes at a meal.
7. Secure cooperation of family in eating foods prepared in new ways and in using unfamiliar foods and dishes.
8. Save through knowledge of food values.
9. Save through—
   (*a*) Intelligent planning of meals.
   (*b*) Wise selection of foods.
   (*c*) Careful handling and storage.
   (*d*) Skillful preparation—e. g., thin paring.
   (*e*) Good cooking.
   (*f*) Judicious service: The gospel of the clean plate.
   (*g*) Use of left overs.

LESSONS III AND IV.

WHEAT CONSERVATION.[1]

OUTLINE.

THE WHEAT SUPPLY OF THE WORLD.

South American reports indicate abnormal shortage.
Russian supply can not be brought to western Europe.
Australian supply can not be shipped because of long journey and reduced shipping facilities.
United States winter-wheat crop seriously damaged.
Canadian crop dependent upon summer rains.

UNITED STATES MUST CONSERVE WHEAT.

Why?—Our own needs of wheat plus our allies' needs of American wheat are more by many millions of bushels than the supply which will be available.

How?—Whenever there is a scarcity of the usual bread grain in a country, there are various methods of meeting the situation, of which the following are particularly applicable to the United States at the present time:

(*a*) Increase of flour by raising the milling percentage, the extraction.
(*b*) Decreasing industrial uses of bread grain or other grains used industrially that can be used in bread making, as in the case of grains used in alcoholic beverages.
(*c*) Increase of bread flour by admixture of other cereals.
(*d*) Substitution of other cereals for the usual bread.
(*e*) Increase of flour by dilution with potato.
(*f*) Substitution of potato.
(*g*) Substitution of vegetables.
(*h*) Transfer of feeding grains to food grains.
(*i*) Substitution of meat and dairy products.
(*j*) Substitution of fats.

Where?—This is a household and commercial problem. Bakers, restaurant keepers, and hotel managers must cooperate with the home if it is to be satisfactorily met.

ELIMINATING WASTE OF BREAD.

Cooperative action of wholesale bakers in refusing to accept return of stale bread.
Bakers agree to reduce the kinds of bread and rolls put on the market.
More careful service of bread in hotels and restaurants as well as in homes.
Use of all stale bread in preparing food in home, restaurant, and hotels.

[1] May be either a talk and one demonstration or two demonstrations.

INCREASE THE PROPORTION OF VEGETABLES IN THE DIET.

Energy supply in the diet to come from other starchy foods than wheat and also those which contain sugar.

Potatoes of all kinds.
Bananas.
Beets.
Corn.
Peas.
Beans.

SAVE ONE-FOURTH OUR WHEAT.

Experience of Europe and European nations shows that 25 per cent of wheat used in bread making may be replaced by other cereals. Beyond that the people can not mix it satisfactorily in their loaf, which is baked almost exclusively in bakeries and not in the home, and because of custom, absence of home ovens, and shortage of fuel.

FOOD VALUE AND IMPORTANCE OF BREAD IN THE DIET.

Special food value of wheat bread as a source of protein (tissue builders) much exaggerated. Other cereals of similar value as source of protein and of energy. While wheat is undeniably the best bread cereal, other cereals are often undervalued.

USE LOCAL CEREAL PRODUCTS.

Make studies of local supplies.

Encourage the demand for grinding other cereals than wheat and corn.

Blended flours should be prepared in the home or bakeshop rather than in the mill, because of internal-revenue regulations.

DEMONSTRATIONS OF LIBERTY BREAD.

If time is limited, demonstrate the corn-meal yeast bread and oatmeal yeast bread.

An exhibit of prepared emergency breads will interest the audience.

DEMONSTRATION OF CEREAL BREADS.

THE WHEAT SUPPLY OF THE WORLD.

Despite the rigid measure adopted to reduce consumption among the allies, they will require to import next year larger amounts of cereals and meats than ever before. The large failure of the winter wheat harvest in France and England, larger consumption by armies in the field and munition workers, the reduced productivity of the land by reduction in man power, the sinking of cargoes by submarines all pile up one increasing demand upon another, despite the efforts of the women in the fields. Moreover, the allies are more isolated to-day in their sources of food than ever before, even during the war. It requires three times the tonnage and double the danger to bring wheat from Australia and India than from the Atlantic seaboard, and to-day these sources are largely unavailable. The crop failure in the Argentine gives

no hope from that quarter until next March or April, and the allies are, of course, isolated from the normal supply of Russia, Roumania, and Bulgaria. They are thus dependent upon North America for the vast majority of their food imports.

In a general way it may be stated that this country normally produces a surplus of most commodities, and that our problem is to secure the effective and economical distribution of these supplies; to induce as large an export surplus for the benefit of our allies as we can; to protect our own requirements; to ask the whole community to assist us in building up this surplus by every effort of economy that we can devise, and to set up such machinery as will furnish this balance wheel on prices.

At best the food of our allies will be a privation loaf, and every ounce we can add to it is a contribution to her strength and constancy in the war.

I think that it is recognized by all thinking men that the world war and the economic forces which have been set up have disorganized the ordinary balances and checks on prices. For instance, the price of wheat in normal times is a factor, not only of supply in the United States, but all the supplies in every country in the world."

THE UNITED STATES MUST CONSERVE WHEAT.

1. By eliminating waste in the use of all breads and cereal products.
2. By eating more vegetables in place of other foods, especially during the summer months.
3. By substituting for wheat breads which, whether made at home or by the baker, combine with wheat flour from 10 to 25 per cent of other cereal products or suitable flours or meals, as peanut flour, soy-bean flour, or with potato or sweet potato.
4. By using other cereals for bread making—for instance, rye, which will make a yeast-raised bread, and others, like corn, oatmeal, kaffir, and buckwheat, which can be used without flour to make "quick breads," such as corn pone, buckwheat shortcake, oat cake, and kaffir pone.

ELIMINATING WASTE OF BREAD.

1. Through the efforts of the food administration many wholesale bakers have agreed to stop taking back unsold bread from the retailers. This alone may save 5 per cent of the waste. We can not afford to sell stale bread for animal feed. The women of the country must cooperate with the retailers and order their bread 24 hours before it is to be delivered.
2. The bakers are agreeing to put on the market fewer kinds of breads, and these in smaller sizes, so that here again waste will be lessened.
3. All stale bread may be utilized through combining bread crumbs in the making of quick breads, yeast breads, scalloped vegetables, and similar dishes and desserts. Cutting the loaf on the table as needed also tends to lessen waste.

CONSERVING THE WHEAT THROUGH INCREASING THE PROPORTION OF VEGETABLES IN THE DIET.

We as a people are depending largely upon cereals for our energy supply. It is easily possible to use less cereal and make larger demands for energy on starchy vegetables. Our average consumption of potatoes per capita is about 9 ounces per day. If we could be induced to take an additional daily average of only 4 ounces of potatoes—that is, about one good-sized potato—our demand for bread would be reduced by about that amount per individual. Other heat-giving foods, such as sweet potatoes, bananas, corn, peas, and beans, may be used to reduce the demand upon cereals. On such a basis we may advocate decreased bread consumption.

CONSERVING ONE-FOURTH OUR WHEAT THROUGH USING LIBERTY BREADS.

For those of us who, through force of habit, demand bread three times a day what is known as liberty bread may be used much more liberally in place of the wheat-flour loaf. These liberty breads are made by using the entire wheat ground into flour or substituting other cereals for part of the wheat flour. Corn is the native American cereal upon which we can rely for bread. Alone or mixed with flour it can be used in very many ways as a foodstuff. It is no new thing to us, and in depending upon it at this time we are only going back to earlier customs which have survived in the South more than in the North. It is sometimes said that too much corn is unwholesome, but this is not true. Pellagra, the disease once attributed to it, is not due to corn, but to another cause. For centuries barley and rye have been staple breadstuffs. It is within recent years that barley has dropped out of the diet of Americans so largely as a breadstuff, though retained in some special forms, particularly in infant feeding. Returned to its former place, it will take the place of thousands of bushels of wheat and will produce a bread delicious in both flavor and texture. If we are willing to substitute for wheat flour from 20 to 35 per cent of other cereals, we can easily free the wheat needed for shipment to the allies.

FOOD VALUE AND IMPORTANCE OF BREAD IN THE DIETARY.

In the United States wheat bread is universally used and has become the chief means for giving the needed energy in the diet. Its tissue-building power is below that of most animal foods, dried peas, and beans and is unsatisfactory unless supplemented by other food products. Our safety in its use lies in the fact that we have always combined it in the diet with other foods—meat, peas, beans, or animal soups rich in gelatin. We measure its value primarily by the energy which it yields rather than by its power to supply protein, ash, and growth-regulating substances needed to build or repair body tissue, though even in this respect it is a valuable supplement to the materials on which we chiefly rely as tissue builders.

COMPARATIVE FOOD VALUE AND COST OF DIFFERENT CEREAL PRODUCTS

Estimates of the food values of the following common cereals are approximately equivalent. Patent flour, corn meal, rye, and rice yield about 1,600 calories, and oat meal 1,800 calories, per pound.

NOTE.—It may be of local interest to secure from retailers in a town the price of the various cereals in 1913 as compared with the present price.

USE LOCAL CEREAL PRODUCTS.

A study should be made of the available local supply for the State or section of the country, using those cereals which are grown and ground in the immediate locality. Corn meal and rolled oats are available in almost every section of the United States. Barley and rye are less generally grown and sold in the retail markets. Rice may be used in so many other ways that its use in bread making is a minor factor. There promises to be a large yield of buckwheat which may be used in conserving our wheat supply. What we need to push is the use of barley flour, buckwheat flour, and rye flour. Kaffir and other grain sorghums are to be noted also, as they are of especial value in the sections in which they are grown. There is no difficulty in grinding and putting upon the market any of these products. It may not be wise at this time to advocate the selling of blended flours, as under the internal-revenue act it makes the work of the food commission arduous. Do your own blending in making homemade products.

DEMONSTRATIONS OF EMERGENCY BREADS.

1. SAVE THE WHEAT—USE CORN AND OATS.

Selection for demonstration.—Three from the following list of products: Corn-meal griddle cakes, oat-meal muffins, and Indian pudding are suggested.

Introductory statements.—Make it a principle to increase the use of corn meal to the maximum. Pound for pound, the energy value of corn meal is equivalent to that of wheat flour. Every time corn meal is used where before we used wheat products, we are helping to win the war.

Have corn-meal mush for breakfast; add figs, dates, or other fruit, for variety; serve fried mush; use corn meal in quick breads, yeast breads, desserts. The breads are light, palatable, and capable of frequent use in the weekly dietary. Likewise, make the maximum use of oat meal or rolled oats. Omit all wheat breakfast cereals. Use oat meal or rolled oats, and secure variety through adding fruit. Use rolled oats to conserve one-fourth the wheat in making muffins, rolls, and yeast-raised bread.

PROPORTIONS AND DIRECTIONS.

All measurements are level, and flour is measured after sifting. Proportions are for Minnesota flour.

CORN-MEAL GRIDDLE CAKES OR WAFFLES, I.

1 cup milk (8 ounces).
¾ cup flour (3 ounces).
¾ cup corn meal (3¾ ounces).
2 teaspoons baking powder (¼ ounce).
½ teaspoon salt (⅛ ounce).
1 egg (2 ounces).

Add beaten egg to milk and add to dry materials, well mixed.

CORN-MEAL GRIDDLE CAKES OR WAFFLES. II.

1 cup sour milk (8 ounces).
¾ cup flour (3 ounces).
¾ cup corn meal (3¾ ounces).
½ teaspoon soda (1/14 ounce).
1 teaspoon baking powder (⅛ ounce).
½ teaspoon salt (⅛ ounce).
1 egg (2 ounces).

CORN-MEAL MUFFINS, I.

1 cup milk or water (8 ounces).
1⅓ cups flour (5⅓ ounces).
⅔ cup corn meal (3⅓ ounces).
1 to 2 tablespoons fat (½–1 ounce).
1 to 2 tablespoons sugar (½–1 ounce).
1 egg (2 ounces).
4 teaspoons baking powder (½ ounce).
½ teaspoon salt (⅛ ounce).

Method I: Mix milk, egg, and melted fat, and add dry ingredients, well mixed.
Method II: Scald corn meal with the hot milk; add egg, melted fat, and dry ingredients.

CORN-MEAL MUFFINS, II.

1 cup sour milk (8 ounces).
1⅓ cups flour (5⅓ ounces).
⅔ cup corn meal (3⅓ ounces).
1 to 2 tablespoons fat (½–1 ounce).
1 to 2 tablespoons sugar (½–1 ounce).
1 egg (2 ounces).
½ teaspoon soda (1/14 ounce).
2 teaspoons baking powder (¼ ounce).
½ teaspoon salt (⅛ ounce).

Combine as in corn-meal muffins I, method I.

INDIAN PUDDING.

¾ cup cornmeal (3¾ ounces).
1 quart milk (32 ounces).
1½ teaspoons salt (⅜ ounce).
3 tablespoons sugar (1½ ounces).
or
⅓ cup molasses (4½ ounces).

Heat the milk. Sift in the cornmeal as in making mush. Add salt and sugar. Turn into buttered baking dish, put dish in pan of water, and bake very slowly 2½ to 3 hours. Serve with hard sauce, cream, or crushed fruit.

OATMEAL MUFFINS, I.

½ cup milk (4 ounces).
1 cup cooked oatmeal or rolled oats.
1 egg (2 ounces).
2 tablespoons fat (1 ounce).
1½ cups flour (6 ounces).
2 tablespoons sugar (1 ounce).
½ teaspoon salt (⅛ ounce).
4 teaspoons baking powder (½ ounce).

Cook oatmeal, using one part oatmeal to two parts water. A larger proportion of water makes too soft a mush and gummy muffins. Mix milk, oatmeal, egg, and melted fat. Add dry ingredients after sifting them together. Bake 25 to 30 minutes. This makes 10 to 12 muffins.

OATMEAL MUFFINS, II.

1½ cups milk (12 ounces).
2 eggs (4 ounces).
2 tablespoons fat (1 ounce).
2 tablespoons sugar (1 ounce).
1 teaspoon salt (½ ounce).
2 cups rolled oats (5½ ounces).
1 cup flour (4 ounces).
4 teaspoons baking powder (1 ounce).

Pour milk over oats and let soak one-half hour. Add eggs and melted fat. Add to dry ingredients, which have been sifted together. Bake 25 to 30 minutes. This makes 10 to 12 muffins.

II. Use Corn and Oats in Bread Making.

DEMONSTRATION OF CORN-MEAL AND OATMEAL YEAST BREADS.

Introductory statements.—Corn-meal yeast bread, satisfactory in texture and mild in flavor, can be made using 20 per cent by measure or 25 per cent by weight of total cereal as corn meal. The flavor of white corn meal

is less distinctive and the bread made from it differs in color from that of the usual wheat loaf less than that made from the yellow meal. These breads may be made by combining dry corn meal with the flour, but the product is less satisfactory than that in which the meal is first cooked as for corn-meal mush. The manipulation is the same as for wheat bread, except that it is a little more difficult to knead into the mush the full amount of flour and the dough is somewhat softer and stickier. Baking should occur in a slower oven, and should continue over a longer period—at least an hour.

Oatmeal yeast bread is coarser than wheat bread, and is not unlike graham bread in appearance. It has a sweet, nutty flavor, much liked by persons who care for whole wheat or dark breads. Some care is necessary in combining the rolled oats with the mixture. The most satisfactory method has been found to be that of pouring the hot liquid over the rolled oats, allowing the mixture to cool rather slowly (about half an hour). Longer soaking of the oats produces a somewhat moister bread. The manipulation is the same as for wheat bread. The dough is a bit softer. Baking requires about 45 minutes.

PROPORTIONS AND DIRECTIONS.

All proportions are for one loaf. The amount of yeast provides for a very short process—3½ to 4 hours. One-half the yeast suggested will make bread in 5 hours.

One cake of dry yeast used as a starter should produce yeast for six loaves. In all cases the amount of liquid should be equal to that added with the compressed yeast in the recipe given.

CORN-MEAL YEAST BREAD (1 LOAF).

1¼ cups milk and water or water (10 ounces).
2 tablespoons sugar (1 ounce).
1 tablespoon fat (½ ounce).
2 teaspoons salt (½ ounce).
⅔ cup corn meal (3⅓ ounces).
2⅓ cups flour (9⅓ ounces).
½ cake compressed yeast (¼ ounce).
¼ cup warm water (2 ounces).

Add sugar, fat, and salt to liquid, and bring to boiling point. Add corn meal slowly, stirring constantly until all is added. Remove from fire, cool mixture, and add compressed yeast softened in ¼ cup warm water. Add 2⅓ cups flour and knead. Let rise until about double its bulk, knead again, and put in the pan. When light, bake in a moderate oven for at least an hour.

In mixing the dough the flour and corn meal are to be used as separate ingredients, because the corn meal must be scalded or a grainy bread results. When the corn meal mixture is removed from the stove, the housewife will doubt her ability to add the amount of flour called for. The flour will work in, as required, but a stiffer, stickier dough than that to which she is accustomed will result.

OATMEAL YEAST BREAD (1 LOAF).

1 cup milk and water, or water (8 ounces).
1 teaspoon salt (¼ ounce).
1 tablespoon fat (½ ounce).
2 tablespoons sugar (1 ounce).
1 cup rolled oats (2¾ ounces).
2½ cups wheat flour (10 ounces).
½ cake compressed yeast (¼ ounce).
¼ cup warm water (2 ounces).

Scald liquid and pour it over the rolled oats, sugar, salt, and fat. Let stand until lukewarm (about half an hour). Add yeast softened in warm water. Add flour and knead. Let rise until double its bulk. Knead again and place in pan. When light, bake in a moderate oven from 45 to 60 minutes.

III. Use Barley, Rye, Boiled Rice, and Boiled Potato in Bread Making.

COTTONSEED FLOUR—DEMONSTRATION OF BARLEY, RYE, RICE, OR POTATO FLOUR YEAST BREADS.

Selection for demonstration.—Two of above breads, according to local and available products.

Barley yeast bread.—Introductory statement: Bread may be made using wheat flour and barley flour in mixtures containing from 33⅓ to 50 per cent barley flour. The bread containing one-third barley flour is light, palatable, and of especially pleasant flavor. A larger percentage produces a heavier, darker bread of pronounced barley flavor. The manipulation for this bread is the same as for wheat bread. The conditions and time for baking are also the same. The loaf is smaller.

Proportions and directions:

BARLEY YEAST BREAD.

1 cup milk and water, or water (8 ounces).
1 tablespoon sugar (½ ounce).
1 tablespoon fat (½ ounce).
1 teaspoon salt (¼ ounce).
1⅙ cups barley flour (4 ounces).
2⅓ cups wheat flour (9⅓ ounces).
½ cake compressed yeast (¼ ounce).

Soften the yeast in part of the liquid. Combine ingredients. Mix into a dough. Knead and let rise to double original bulk. Knead again. Put in the pan, and when again double in bulk bake about 45 minutes.

Rye yeast bread.—Introductory statements: Commercial rye breads are made of a mixture of wheat and rye flours, known in the trade as 50–50. Rye flour has much less expansion than wheat flour; hence the loaves are smaller. The manipulation is the same throughout as for wheat bread.

Proportions and directions:

RYE YEAST BREAD.

1 cup milk and water, or water (8 ounces).
1 tablespoon fat (½ ounce).
2 tablespoons sugar (1 ounce).
1 teaspoon salt (¼ ounce).
2¼ cups rye flour (7 ounces).
2¼ cups wheat flour (9 ounces).
½ cake compressed yeast (¼ ounce).
2 tablespoons water (1 ounce).

Combine ingredients. Mix into dough and knead. Let rise until double original bulk. Knead again. When again double bulk, bake about 45 minutes.

Rice yeast bread.—Rice has many other uses, as in puddings, etc., and is much in demand among the allies. Therefore its use should not be stressed in connection with emergency breads.

Cooked rice, combined with wheat flour makes delicious muffins and yeast bread. There are many ways of cooking the rice. The basic principles may be stated as follows: First, cook the rice so as to conserve all mineral matter and other soluble products.

Method: After the rice is thoroughly washed it should be put in a thick iron kettle or stoneware baking dish, cold water added so that the water stands three-quarters of an inch to an inch clear above the rice. A heavy or weighted cover should be used to seal the dish. Cook slowly over direct heat or in the oven until all the water has been absorbed and the grains are soft and steam escapes from the vessel. This is the Japanese method. The second method, more frequently used in the

United States, is to use a very large amount of boiling water to a small amount of rice, the rice being added slowly enough not to stop the boiling. The water is boiled briskly 20 minutes, or until the kernels are tender. Then it is drained in a colander or strainer, set on the back of the stove, or put in a slightly warm oven or in a pan over hot water, to dry off a bit. There results a fluffy mass of large, plump grains, each perfectly distinct in itself, instead of the gummy mush so often served as boiled rice.

The rice yeast bread is very white in color, is moister than wheat bread, and keeps moist longer. It is handled in much the same manner as wheat bread. The first dough, however, is much stiffer, and after once rising the light dough is so soft that it can not be kneaded with the hands. It should be well stirred with a strong spoon and placed in the pans, looking much like a stiff drop batter. After baking the upper crust is less smooth than that of our familiar wheat flour loaf.

Proportions and directions:

These amounts make two large or three small loaves of bread.

RICE YEAST BREAD.

½ cup milk and water or water (4 ounces).
4 tablespoons sugar (2 ounces).
4 tablespoons fat (2 ounces).
1½ teaspoons salt (⅜ ounce).
7 cups boiled rice.
8 cups flour (32 ounces).
½ cake compressed yeast (¼ ounce).
¼ cup warm water (2 ounces).

Scald liquid if milk is used. Pour over fat, sugar, and salt. Cool and add yeast, moistened in ¼ cup warm water. Add rice and flour and knead. After second rising bake 45 minutes.

Potato yeast bread.—Introductory statements: Boiled potatoes, mashed and combined with wheat flour may be used in making a bread of good flavor and texture. The potato bread is slightly darker in color than patent flour bread and is also somewhat more moist. It is relished by persons who do not care for any but so-called "white bread." Two manipulations are satisfactory. Either all the flour may be added in the first mixture, making a dough which is very stiff and difficult to knead or a part of the flour may be reserved and added with the second kneading. In either case the dough is soft at the second handling, but after baking it produces a satisfactory loaf.

Proportions and directions:

The following amounts make three loaves of bread.

POTATO YEAST BREAD.

½ cup milk and water or water (4 ounces).
4 tablespoons sugar (2 ounces).
4 tablespoons fat (2 ounces).
1½ teaspoons salt (⅜ ounce).
4 cups boiled potatoes.
8 cups flour (32 ounces).
½ cake compressed yeast (¼ ounce).
¼ cup warm water (2 ounces).

LESSON V.

CONSERVATION OF MEAT.

OUTLINE.

State world supply. (See tables attached.)

State United States supply. (Either tables or per cent increase of meat *vs.* per cent increase of population.)

General habit of meat consumption in United States. (See 61 Cong. Report (British Com.).)

Need of tissue-building foods in diet. (Give list of foods high in tissue-building power.)

Discuss meat substitutes as adequate combinations: Fish, eggs, milk, and milk products as cheese, peanuts, or soy beans, cereals plus beans or milk, wheat plus gelatin dishes.

Safe standard to follow: Give subsistence diet; give workingman's diet.

Working program—Recommended procedure:

1. Use of larger local supply of animal foods:
   - (*a*) Poultry and eggs.
   - (*b*) Game in season.
   - (*c*) Fish, including little-used varieties.
   - (*d*) Skim milk.
   - (*e*) Milk and cottage cheese.
2. Vegetable foods:
   - (*a*) Legumes (peas, beans, peanuts, lentils, cow peas, and soy beans).
   - (*b*) Cereals—oats, rye, barley.
   - (*c*) Nuts—local supply.
3. Use left-over meats as flavors:
   - (*a*) In soups.
   - (*b*) With cereals (corn).
   - (*c*) With legumes.
   - (*d*) With green or starchy vegetables.

WORLD SUPPLY OF MEATS.

The world's available supply of meat is not sufficient to meet the needs of the United States and of our allies unless we practice economy, particularly in the consumption of those meats which are readily transported, namely, beef, mutton, and pork.

Any attempt to give exact figures which will state the world's supply of meat is hopeless, but a few figures may indicate the condition in the United States January 1, 1917. At that time we had 63,617,000 cattle, 67,453,000 swine, and 48,483,000 sheep. This includes all dairy stock, which must be saved to meet the increasing demand for milk and milk products. The figures for France, England, and Italy are all of them at least a year old, and therefore can not be given as representing present

conditions. France has attempted to save her dairy cattle. The sale of meat has been restricted by legislation. The horses killed at the front are shipped directly to Paris for sale in the public markets. Even this additional supply has not met the demand, so that the sale of meat is not only restricted in amount to individuals but is also restricted to certain days in the week. England, because of lack of cattle feed due to the increased acreage devoted to raising field crops for human consumption, is reducing her total livestock through increased slaughter for human use. Her food regulations, issued in May of this year, therefore show a definite increase in the amount of meat that may be purchased per individual. This condition must necessarily be temporary, and England will be again reduced to a very restricted meat requirement. France and Italy have long used meat economically, depending upon the use of small amounts of meat to make the vegetable products savory, either in the form of soups or stews or pastries.

GENERAL HABIT OF MEAT CONSUMPTION IN THE UNITED STATES.

When the British commission was sent over from England in 1909 to study the living conditions of the American workmen as contrasted with the conditions of the English workmen, they published a volumnious report as the result of the study in all sections of the East, Middle West, and South. These studies showed conclusively that the diet of the American people was very much better than the diet of the English workmen, but the striking point was our lavish use of our meat supply. This, in spite of the fact that the lessening of the free pasture land and the increased cost of feed grains had brought about a condition of lessened meat production relative to the population of the country. Careful summaries show that the present daily consumption of beef is three and six-tenths ounces per capita, and of pork four and five-tenths ounces per capita.[1] The suggestion that is being made is that we as a people reduce this total consumption 1 ounce per day, and if possible an additional ounce be replaced by the use of all kinds of fish, preferably a local supply; by increased use of whole cream cheese and a local use of poultry and eggs, where the prices are not prohibitive. If the suggestion of doubling the quantity of vegetables used is followed, the diet will be improved in variety without lowering its nutritive value.

NEED OF TISSUE BUILDING IN THE DIET.

The need of tissue-building material in the diet is so well understood that the only discussion necessary here is in connection with the amount of protein and the character of the protein in the foods available for man. All proteins are made up of complex nitrogen products, which are often called "building stones."

Some proteins contain these "building stones" in proper proportion for the building of new tissue. Others lack some of the essential "building stones." The foods containing the first type are called complete or efficient tissue-building foods. The other are known as incomplete or inefficient tissue-building foods. The value of meats in the diet lies in the fact that they belong to the complete type of protein foods, and therefore when used liberally in the diet the necessity for

[1] This includes refuse or meat as purchased.

intelligent choice is eliminated. The list of perfect or efficient proteins includes beef, veal, mutton, lamb, pork, poultry, game, fish, cheese, milk, and eggs. The inefficient proteins, those which need supplementing with more or less from those of the first group are soy bean, peanuts, navy beans, wax beans, kidney beans, lima beans, dried peas, lentils, nuts, corn, wheat, oats, barley, rye, buckwheat, gelatin.

For the young child, the youth and anyone recovering from a wasting disease there must be combinations of protein foods which will give the right combination of "building stones." As has been stated, for the young child milk stands first on the list. For the adult the need for large amounts of the more nearly perfect proteins is not apparent. Their diet can be more easily restricted to a limited use of the first list and a liberal use of the second.

ADEQUATE COMBINATIONS OF PROTEIN FOODS.

In any discussion of exchange values in this class of foods the relative digestibility of the proteins is an important factor. The proteins in the first list are, as a rule, quite completely and easily digested. The proteins of the second group are not so easily or completely digested. They contain a great deal of what is called "roughage," which while it has the advantage of aiding in the quicker elimination of waste material from the alimentary canal, has the disadvantage of not permitting the protein to be so completely absorbed. In some cases bacterial action in the alimentary canal may be increased with this type of food, hence individual peculiarities may prevent their more liberal use. As a general rule, the proper combinations of these foods may be given as follows:

Cereals do not help each other out because their "building stones" do not supplement each other.

Legumes (peas, peanuts, and beans) do not help each other for the very same reason.

Most legumes, combined with cereals, make a more nearly efficient protein combination.

Gelatin supplements the lack of some of the "building stones" in most of the cereals, but it does not help out the lack in the legumes.

The combination of any of these with milk or cheese or meat or eggs is efficient.

SAFE STANDARD TO FOLLOW.

The diet of the American people should be so selected that the average for men, women, and children is at least 70 grams (about 2½ ounces) of protein a day. One-fourth to one-third of this may come from cereal foods, one-seventh may come from milk and its products, one-seventh to two-sevenths from animal proteins, the remainder to be secured from a wise combination of vegetables and fruits. The detail of this is a study by itself and will be discussed in Lesson IX.[1]

[1] Interesting comparison: For supplying protein, 1 pound of cottage cheese equals 1.09 pounds round steak, 1.27 pounds sirloin steak, 1.31 pounds hind leg of lamb, 1.37 pounds breast of veal, 1.37 pounds chuck rib beef, 1.44 pounds smoked ham, 1.46 pounds fresh ham, 1.52 pounds fowl, 1.58 pounds loin pork chop.

WORKING PROGRAM.

Because of the difficulty of securing adequate transportation facilities, it is wise to use very largely the local supply of animal foods, discouraging as much as possible the killing of young animals, as veal and lamb. Poultry and eggs, game in season, and all varieties of fish should be used, but next to maintaining our regular bread supply, the most important factor is to increase the use of milk in so far as our supply will admit. The present supply seems to indicate per capita allowance of about one-third of a quart a day. In case of lack of adequate amount for the family, it is wiser to limit the use of the milk to direct consumption by children and to the use in the preparation of foods for the table. The utilization of the protein from the cereals in the feeding of the dairy cow shows that we recover more of the proteins in milk than we would if it were used to produce muscle.

1. For example, we recover from 35 to 50 per cent of the protein in the feed when it comes to us in the form of milk, but only from 10 to 20 per cent in the form of beef proteins. In other words, we get 300 per cent more return on the investment through the consumption of milk. For this reason every ounce of the available milk supply should be used as food, either in the form of milk itself, whole or skim, or in the form of whole-milk cheese or cottage cheese and butter.

2. Vegetable food, as peas, beans, peanuts, lentils, cereals, as oats, rye, barley, and any local supply of nuts may be used to supplement a milk, fish, or egg diet.

3. No meat should be wasted. All left over meats may be used as a source of flavor as follows: In vegetable soups, stews, goulashes, gravies, pies, creamed meats, cereal pilafs, chowders, casserole dishes, and with green vegetables.

4. Fresh fish may be used in the same way that meats are used, and with proper choice of flavoring material, are often preferred to the meat dishes.

5. Cheese may be used as a supplement to all of the group of protein foods that are listed under incomplete proteins. The soup kitchens of the Germans may teach us many lessons on how to extend the use of meat as flavor.

Demonstrations may be used with this lesson.

LESSON VI.

OUTLINE.

SUGAR.

Introduction:

Relative importance of fats and sugars.

General per capita consumption in the United States.

Experience of Europe (English rules—no cake to contain over 15 per cent sugar): (*a*) reduction in use; (*b*) substitution in use of dried fruits with foods.

Importance of sugars in diet: (*a*) Flavor; (*b*) readiness of assimilation; (*c*) tolerance.

Kinds and food value and use: (*a*) Adult; (*b*) youth; (*c*) infant.

Safe standard to follow: Three ounces per day per person.

Working program:

1. Method of eliminating waste. (Use less sugar on breakfast cereals and in drinks.)

2. Use desserts which do not require sugar, as fresh fruit. Select breads, cakes, desserts, etc., which call for less sugar than usual. Omit frosting. Use less sugar in form of candies and in soft drinks.

3. Use sirups in developing flavors. Use sirups in candy making. Use sirups in cake making. (Illustrate with products made from sirups rather than granulated sugars.)

4. Use fruits (fresh and dried).

FATS.

Approximate fat consumption by nations: Give limitation on local supply. (This must be a State situation.)

General United States habit in fat consumption: Ninety-six grams per individual per day. (This includes all fat waste.)

Kinds of fats—Food value and uses: (*a*) adult; (*b*) growing youth; (*c*) growing child; (*d*) infant.

Safe standard to follow.

Working program. Recommended procedure:

I. Use of larger variety of fats.

(*a*) Illustrate with samples of all types of fats which may be used as food; (*b*) Illustrate with food products made through use of different sorts of fat, unrendered (suet or chopped pork), solid (as lard), liquid (as cottonseed or other vegetable oil).

II. Methods of eliminating waste: (*a*) Discuss methods of fat saving. (1) Clarifying fats; (2) reducing use of cream by using top milk; (3) serving moderate portions of butter with second helpings when wanted, and so reduce plate waste; (4) train children to eat fats in meats, so it will not be left on plates; (5) give preference to recipes and methods of cookery calling for small quantities of fat.

Reference: United States Department of Agriculture, Bulletin No. 469, Economical Use of Fat in the Home.

INTRODUCTION.

In any discussion of possible readjustments in dietary habits made desirable by changes in the food supply, it is necessary to bear in mind the particular rôle played in nutrition by the different food materials and the nutrients they supply. The materials considered in this lecture, i. e., those rich in fat and sugar, serve primarily to yield energy for the muscular activities of the body; but they are not the only food materials used in this way, nor is this their only function.

Protein, fat, and carbohydrates (including both starches and sugars) can be burned in the body to yield energy; but because of its unique importance as a material for tissue building, it is usual to consider protein as reserved for that purpose, and to depend on fats and carbohydrates for energy. Of these the starches (obtained chiefly from cereals and potatoes) are used in the greatest amount, both because of their greater abundance and cheapness and because it is possible to eat them freely without either digestive disturbance or satiety. The fats and sugars, on the other hand, are relatively scarce and expensive, and there is a narrower limit of tolerance for them even among healthy individuals.

Fat is, so to speak, a more concentrated fuel than protein and carbohydrates. A given weight of it yields two and one fourth times as much energy as the same weight of either of the other two. This difference must always be borne in mind in estimating the energy value of different foods and diets.

Taking into account this difference, fats and carbohydrates were formerly considered interchangeable as sources of energy. The ordinary American diet was found to contain 1 part (by weight) each of protein and fat to 4 parts of carbohydrates; but it was believed to be a matter of theoretical indifference whether or not these proportions were followed, providing the total protein and energy were adequate. Later research has modified this opinion in at least two particulars.

It is now considered necessary to include in the diet at least limited amounts of certain kinds of fat because dissolved in them are found substances indispensable for normal growth. Attractive flavor and texture in food are believed to be of physiological importance. A palatable diet tends to stimulate the normal progress of stomach digestion, which is a different matter from thoroughness of digestion. Our dietary tastes and habits make it difficult to prepare an attractive diet without the use of some fat and sugar.

Fat in the diet also delays the occurrence of hunger after eating.

The following sections indicate the way in which the desirable amounts of sugar and fat can be included in the diet without waste of material and consequent unnecessary drain on the available supply.

APPROXIMATE SUGAR CONSUMPTION AND DIETARY HABITS AS REGARDS SUGAR.

In common parlance sugar refers to the "cane sugar" obtained from sugar cane or beet root, but the chemist distinguishes between various kinds. The latter (sucrose, lactose, glucose, levulose, dextrose, etc.) vary more in flavor than in final digestibility and food value. The use of sugar (exclusive of that naturally present in fruits, vegetables, etc.) in the United States has been on an average practically 4 ounces per day per capita. While not all of us use 4 ounces of sugar daily, many

of us will be found to use that amount and even more if we include all forms of sweets, i. e., not only the sugar eaten on fruits and cereals, or in tea, coffee, etc., but also that used in general cooking, and in cakes, desserts, preserves, candies, "soft drinks," etc. The fact that there is now a limited supply to meet all demands for sugar will require us to reduce our consumption. From present indications it would seem that if we could reduce it to an average of 3 ounces daily we would meet the situation. The experience in Europe seems to indicate that the use of sugar is largely for the psychological effect of the sweet flavor, which helps make palatable the less highly flavored foods such as cereals. It has been used in the armies in the form of jams. Ian Hay tells some amusing stories of English "Tommies" who would face any danger cheerfully, but broke into open rebellion when deprived of their strawberry marmalade.

Americans have come to consider a generous amount of sugar as a necessity of life, but on analysis we find that its use can be defended only on the psychological ground of the palatability its flavor lends to the diet, and (under special conditions of muscular exertion) on the ground that its energy becomes available to the body more rapidly than that of the other nutrients.

On the other hand, the excessive use of sugar is not only economically extravagant but may cause digestive disturbances. The amount which one can eat with impunity depends on the muscular activity, the amount of other foods in the diet, and, in case large quantities of sugar are consumed, on the tolerance of the individual for it. Persons of great muscular activity, like athletes, soldiers on exhausting marches, or the never-quiet schoolboy, require more energy-yielding food than less active persons of the same size and weight, and their craving for sweets may be legitimate. Under-nourished children of the city poor, who spend their pennies for candies, may obtain in this way a desirable supplement to their inadequate meals. But where the meals are adequate or even excessive, eating sweets in addition overtaxes the digestive organs, tends to corpulency, and spoils the appetite for less highly flavored but equally nutritious food. The latter consideration is of especial importance with children, whose appetite for sweets is much stronger than that of adults and than their own appetite for the more essential tissue-building foods.

In the matter of infant feeding, milk sugar (lactose) is giving place to ordinary sugar (sucrose) which seems to be equally healthful and is much cheaper. For adults, convenience and economy may safely decide whether the sweet flavor shall come from ordinary white sugar (pure sucrose), brown sugar, molasses, or maple sugar (sucrose with admixture of other substances), corn sirup (glucose), honey (chiefly levulose and dextrose), or from the sugar naturally present in many fruits and vegetables, and especially abundant when these have been concentrated by drying.

WORKING PROGRAM.

As a working program on reducing the present use of sugar the following may be recommended:

1. Train the family to use little or no sugar on the breakfast cereals or replace by fruits eaten with the cereal or dried fruits, raisins, dates, etc., cooked with it. Most palates crave less sugar on these foods if the latter are well cooked and carefully salted.

2. Reduce the use of soft drinks, lemonades, etc., in the making of which sugar is used very liberally.

3. In preparing the food for the family give preference to recipes which call for less sugar, and if possible omit it from yeast bread; reduce the use of candies and cakes, especially kinds in which large quantities of sugar are used. Especially discourage the eating of candy between abundant meals.

4. Use sirups, as corn sirup, apple sirup, and other fruit sirups, molasses and sorghum sirups, and honey wherever it is possible to utilize these products in the place of ordinary sugar.[1] Remember that a good sirup can be made on the farm from apple "culls" and used as a table sirup or in cooking.[2]

5. Use more fruits, both fresh and dried, to give the desired sweet flavor to the diet.

APPROXIMATE FAT CONSUMPTION DAILY PER CAPITA.

Before the war the approximate consumption of fats was practically according to the following table:

Country.	Animal.		Vegetable.		Total.	
	Grams.	Ounces.	Grams.	Ounces.	Grams.	Ounces.
United States	84	3.0	12	0.42	96	3.42
Great Britain	80	2.8	9	.31	89	3.11
Germany	62	2.2	4	.14	66	2.3
Austria-Hungary	23	.8	6	.21	29	1.1
France	30	1+	15	.53	45	1.5
Italy	14	.5	39	1.38	53	1.8
Russia	16	.56	10	.35	26	.91
Japan [1]	14	.5	10	.35	24	.85

[1] The figures for Japan have been calculated to the average weight of individuals in other nations listed in the table.

The English stand second in their use of animal fats and comparatively low in their use of vegetable fats. Germany, before the war, used almost one-third less of total fats per capita than we. Under the stress of present war conditions, she has been compelled greatly to reduce her consumption of fats, the effect of which on the population will be discussed later.

GENERAL HABITS OF FAT CONSUMPTION IN THE UNITED STATES.

It has been estimated that on the average over 3¼ ounces (about 96 grams) of fat purchased as such—that is, butter and other table fats, cooking fats and cooking and table oils—are included in the food provided for each person in the United States. This could be cut down to a little over 2 ounces (60 grams) without danger to health, provided the kinds of fat used were carefully chosen and all the fat from meat trimmings and meat cookery were used to advantage. At present fats are chosen more for

[1] It may be interesting to the audience to have prepared different sirups and candies and cakes made with the sirups and honey.

[2] U. S. Dept. Agr. Yearbook, 1914, pp. 227–244.

pleasant flavor and culinary convenience than with reference to their distinctive nutritive value. The waste from this class of foods is large. City garbage has been found to yield from 35 to 40 pounds of fat per ton, all coming from homes, hotels, and restaurants.

KINDS OF FATS—FOOD VALUE AND USES.

If fat were needed only for the production of energy in the body, it would be a relatively simple matter to cut down on our use of lard, butter, table oils, and other separated fats, and depend more on cereals, potatoes, and other starchy foods. Recent discoveries regarding the substances which regulate the growth and repair of body tissue, however, have shown that such a course would not be safe. Associated with fat in certain food materials, especially in the fat of milk and eggs, such meat fats as suet, and the small amounts of fat found in the green leaves of potherbs and salad plants, are minute quantities of recently discovered and as yet unnamed substances most important in nutrition.[1] These are sometimes referred to as "growth determinants." When these are lacking, even in an otherwise adequate diet, growth of new tissue and repair of old does not take place as it normally should. We do not yet know exactly how much of these substances is found in different kinds of fats, or how much is needed by children or adults, but it is now impossible to consider the question of fat in the diet without considering them.

Conditions in the warring nations of Europe where the fat ration has been cut to the lowest limit have shown that such a practice hinders the normal growth of children, the maintenance of health in adults, and the repair of body tissue after wounds.

The list of foods in which these "growth determinants" are chiefly found includes egg yolk, butter, cream, rich milk, cream cheese, and the leaves of most of the growing plants that are used for greens or salad. Lower in the list will come the table butter substitutes—suet, beef drippings, and possibly goose and chicken fats. It is probable that the other animal fats and most, if not all, of the vegetable oils lack this "growth determinant."

The fact that milk and milk products are so rich in this substance shows the importance of maintaining and increasing the number of dairy cattle in the country and of utilizing all milk in the most economical way. About 50 per cent of the milk production of this country is used in butter production, the other 50 per cent being used in the form of cheese and as milk for direct consumption, or for the preparation of food. Because of the commercial difficulty in utilizing the skim milk and buttermilk left from butter making, it is most desirable to decrease the output of butter and increase the use of cheese, as this utilizes the milk more completely.

The chief nutrient discarded with skim milk and buttermilk is protein, an indispensable and costly factor of the diet; but with it go also small amounts of fat, mineral matter, sugar, and the "growth determinants" which give milk fat its peculiar value. It is evidently a matter of great economic importance, therefore, to lessen the waste of buttermilk and skim milk. One method of doing this is to use milk in cheese making, but

[1] These must not be confused with the water-soluble substances originally isolated by C. Funk and called by him "vitamins." The absence of the latter in the diet is believed to be the cause of beri-beri, scurvy, and other so-called "deficiency" disorders, but does not seem to prevent growth as does the absence of the fat-soluble substances.

this wastes the whey, which is rich in mineral matter. In the last few years some of the buttermilk left in commercial dairies has been used in making a soft cheese, and there is a still more rapidly increasing output of cottage cheese made from skim milk. Skim milk may also be dried and powdered, in which form it keeps almost indefinitely. In this process all the nutrients in the skim milk are saved to be used later as food.

In household practice it is better economy to buy whole milk than cream; the top may be used for coffee, cereal, etc., and the rest for drinking or for cooking. Sour milk, providing it is clean and wholesome, may be used in the household for cooking or for cottage-cheese making. The whey from cheese making contains valuable food material and may be used in bread making.

SAFE STANDARD TO FOLLOW.

The quantity of fat which it is desirable to include in the dietary may be somewhat influenced by its effect on the sensation of hunger. For example, our own American investigators in Germany found that after a lunch of bread and jam without butter the eater became very hungry before the next meal, but that the same amount of bread spread with butter carried him through to the next meal without the sensation of hunger. The probable explanation is that fat digests less rapidly than the carbohydrates, and thus retards the emptying of the stomach and the consequent sensation of hunger.

We must also remember that, while children require fats containing the "growth determinants," a diet too rich in fats is more likely to cause indigestion than in the case of adults; therefore the fats for the child should come largely from milk and eggs rather than from separated fats. Spinach or other green vegetables, which are often given to children because of their richness in iron, are also a source of the fat-soluble substances.

LIST OF FOODS RICH IN FATS.

100 per cent fat.

Commercial shortening or cooking fats.
Cottonseed oil.
Peanut oil.
Olive oil.
Corn oil.
Sesame oil.

80 to 100 per cent fat.

Lard, 92 to 100 per cent.
Fat salt pork, 86 per cent.
Butter, 85 per cent.
Oleomargarine, 83 per cent.
Suet, 81 per cent.
Drippings, Goose oil, Chicken fat, } Per cent depends on methods of clarifying.

40 to 70 per cent fat.

Nuts (meats), 70 to 54 per cent.
Bacon, 64 to 59 per cent.
Coconut, 57 per cent.
Chocolate, 48 per cent.
Whipping cream, 40 per cent.

20 to 40 per cent fat.

American cheese, 36 per cent.
Cream cheese, 33 per cent.
Egg yolk, 33 per cent.
Cocoa, 28 per cent.
Olives, 20 per cent.

Exchange measures among fats—Equivalents to use in replacing butter in cooking.

Food.	Weight in ounces of 1 cupful.	Weight in ounces of pure fat in 1 cupful.	Equivalent (in fat content) of 1 cupful (16 tablespoonfuls) of butter.
Butter	7¾	6. 5	16
Oleomargarine	7½	6. 2	16⅔
Lard	7½	7. 4	14
Hardened vegetable oil	7+	7. 2	14½
Cottonseed oil	7+	7. 2	14½
Suet	3½	2. 8	37 (2c. 5T)
Olive oil	7+	7. 2	14½
Cream	7¾	3. 1	33 (2c. 1T)
Chocolate:			
Grated	2⅔	1. 3	80 (5c.)
In cake	.....	.....	13½ squares
English walnuts, chopped	3	.....	.....

WORKING PROGRAM.

I. Use of larger variety of fats.

(*a*) Preach the gospel of reducing the total amount of fats one-third of an ounce per day for each adult. Preferably this reduction should come in fats other than butter, although the use of butter may be reduced provided milk, cheese, and the green-leaf vegetables are used freely in the diet.

(*b*) Less expensive fats may be substituted for the more expensive animal ones, providing the growth determinants are obtained from other sources.[1]

II. Methods of eliminating waste.

(*a*) Eliminate waste by utilizing all fat left from meats. This is probably the most important household method of reducing the consumption of fat. A great many women do not realize that the trimmings from beef, pork, mutton, and fowl can be rendered and used in cookery instead of fats specially purchased for that purpose. Directions for preparing and using them will be found in any good cookbook.[2]

In some households the amount of fats which accumulates from the meats served is larger than can be used for cooking; in such cases it should be used for making soap, or it should be given away or sold to some one who will use it. Better still, its accumulation should be avoided by choosing and using meats more carefully.

If the fat from meat trimmings or tried out in cookery is available, use it with rational economy when fat must be purchased for cookery.

As far as possible avoid cooking by means of frying and sautéing. If these methods are followed, use rendered fats such as those referred to, not fats specially purchased for the purpose.

[1] Samples of all types of commercial fats used as foods may be used as illustrative material. Cooked food products in which vegetable oils have been substituted for butter or clarified fat (pork or mutton fats) used in place of butter may be on exhibition.

[2] See United States Department of Agriculture Bulletin 469, "Economical Use of Fats in the Home," which may be purchased for 5 cents from the Superintendent of Documents, Government Printing Office, Washington, D. C.

(*b*) Households in which cream is now freely used may with care reduce the amount consumed without greatly lessening the attractiveness of the meals. "Top milk" may be used in tea and coffee and on cereals, baked apples, etc. Unless the meal is otherwise lacking in fat, cream desserts should be sparingly used. Substituting water ices made with fresh fruits for ice cream not only saves fat but utilizes "perishables."

(*c*) We may save table butter by serving smaller portions; not because we should attempt to decrease materially the use of butter on the table, but because so often the portion served is larger than is needed or even desired. Although that which is left on the butter plates might be utilized for cooking, cheaper fats should be used for that purpose.

The recommendation of the food administration is to eliminate the use of butter in cookery in order to make the supply go around so that we may have butter for table use. While all of us may not agree to this, still the more nearly we fulfill that request the more nearly will we meet the vital needs of our own people and the Army at the front.

(*d*) Children should be trained and adults encouraged to eat all the fat served with meat. This prevents waste and lessens the amount of separated fat needed in the daily food.

In all of these recommendations we must remember the psychology of the individual is the most potent factor with which we have to deal. If the issue is pushed too hard or without great tact, we may defeat our own purpose to save a small portion of our food supply for those who are battling to maintain the object for which our nation was created—liberty and democracy.

LESSONS VII AND VIII.

PRESERVING FOOD IN THE HOME.

OUTLINE.

I. Necessity for preserving foods.
II. Consideration of various means of preservation.
III. Canning of fruits and vegetables.
IV. Drying of fruits and vegetables.
V. Preservation of fruits and vegetables by fermenting, salting, and vinegar pickling.

DEMONSTRATIONS ON PRESERVING FOOD IN THE HOME.[1]

I. NECESSITY FOR PRESERVING FOODS.

This season it is imperative, as never before, to avoid the waste of all kinds of food. On account of the increased production in gardens people must appreciate the importance of taking care of the surplus. The use of perishables now to save staple crops for later use has already been emphasized. To save the surplus of perishables will provide variety for the winter diet, lessen the expenditure for food, and help to simplify the growing problem of transportation.

II. CONSIDERATION OF DIFFERENT MEANS OF PRESERVATION.

The present situation demands careful consideration of the best means of preserving different local foods. The selection of canning and drying, or other means, depends upon its suitability to the product being preserved, the cost and difficulty of securing containers, and the ease in handling and storing the finished product.

Canning retains the original form, color, flavor, and texture of fruits and vegetables to a greater degree than do other means of preserving. In addition, canned foods require less preparation before serving. Considering the initial cost of containers, canning is more expensive than drying, brining, or curing. The present shortage of tin and glass makes it more important than formerly to consider whether food shall be canned or not.

[1] The information here assembled is planned for presentation in two lectures accompanied with practical demonstrations. Since much instruction in food preservation has already been given in most institutions, this material will have to be adapted to local needs. If time permits, it will be worth while to have a demonstration showing the procedure in each different method of preserving mentioned. Canning is the most widely used means of preserving large quantities of foods and probably the best understood, so that if one demonstration must be omitted, canning may be that one. Demonstrations on drying fruits and green vegetables, and on the less common method of brining and preservation by fermentation are particularly recommended if all methods can not be shown. If demonstrations are impossible, one lecture can readily be arranged, based on the subject matter herewith. (For the demonstrations, Farmers' Bulletins 839, 853, 841 and the other circulars sent with the lecture will furnish the needed directions.)

Drying furnishes a good substitute for canning, and when properly done gives attractive and wholesome products. Much space in storing and expense of containers are saved, since a ton of many different vegetables in the fresh state when properly dried will average only about 175 pounds in weight.

Brining such vegetables as cabbage, cauliflower, and cucumbers is an economical way of saving these products. Some vegetables can be saved in brine better than by canning them. In brining, fewer containers are required for storing large quantities of vegetables, and containers such as crocks, kegs, and barrels are less expensive than tin and glass.

Storing matured crops is of great importance. Economy demands that such vegetables as legumes and root crops be allowed to mature, since in this state they are more nutritious and less time and money are spent in storing.

Curing of meats is to be considered only when such products are raised on the farm. It is well to encourage the reviving of old methods with the use of the smokehouse, preservation in salt, etc., for carrying over surplus meat on the farm and thus securing delicious products. The canning of meats should not be attempted in the household at the present development of canning methods.

III. CANNING OF FRUITS AND VEGETABLES.

(*a*) *Demonstration of canning.*—Where a demonstration of canning methods seems desirable, details as to equipment and processes may be obtained in United States Department of Agriculture Farmers' Bulletins 839, which is adapted to conditions in the Northern and Western States, and 853, which is for the Southern States.

(*b*) *General suggestions on canning.*—It is important during the present season to consider what vegetables to select for canning and the most economical procedure to use. The following suggestions should have general value:

1. Do not can vegetables which can be matured and form a more nutritious food mature than when canned green. Lima beans and others are examples of this class.

2. Root crops like beets and carrots should be stored instead of canned.

3. Some products like tomatoes can be concentrated in purees and pastes and thus take up less space.

4. Fruit pastes, which are concentrated products made of fruit pulp, can also be considered. These are of thicker consistency than jams and fruit butters and may be dried and packed in layers, thus being economical and convenient.

5. Fruit juices for jelly stock and other purposes can be extracted, bottled in various containers, sterilized, and sealed. Larger quantities can thus be economically saved than than when finished products demanding more time, fuel, and sugar are made in the summer season. If the jelly is made only as needed, fewer glasses will be required since these containers will be used again and again.

6. Valuable fruit sirups which can be substituted for cane and sorghum sirups can be made from juice of apples, scuppernong grapes, and other fruits. Where fuel is plentiful for the boiling processes involved, these are economical because they do not require the use of any sugar. These sirups can also be used instead of sugar when making jams and marmalades of the same fruits.

7. The city housekeeper who cans fruits and vegetables must consider a number of points. In the first place, she must watch the markets to find when local products are available at lowest prices. She must also be assured that the vegetables she secures for canning are fresh. This is most important. Not only is quality injured by staleness, but the difficulty of sterilization is greatly increased. It would be worse than useless to attempt to can vegetables which are being disposed of cheaply because they are almost ready to decay. When fresh vegetables can be secured at reasonable prices, the city housekeeper who wishes to preserve any quantity should further weigh the relative cost of canning and drying, considering equipment, fuel, time, containers, and the vegetables to be preserved. Fruits present fewer problems.

8. In the larger towns and cities, teachers can reach and instruct larger numbers of housekeepers by working through the many well-established existing organizations. Community canning kitchens in the public schools may be started where conditions warrant it; but impartial advice should first be secured from the extension director of the State agricultural college, as such undertakings require trained leadership for success.

IV. DRYING OF FRUITS AND VEGETABLES.

(*a*) *Plan of demonstration in drying.*—Equipment: Use small commercial cookstove drier or homemade drier. Such a drier may be used on a wood or coal range or on an oil or gas stove. If drying is done in an oven, use trays made of galvanized wire screen. Have on hand clean and bright paring knives for paring, several pans, and clean towels. If a thermometer is not used, careful attention must be given to regulating the heat so as not to scorch products. It is best to use a thermometer that registers at least to 150° F.

The drier: Explain the principles of drying and the construction of the homemade drier. (See U. S. Department of Agriculture Farmers' Bulletin 841.)

Selection of vegetables and fruits for demonstration: Select two vegetables and one fruit in season. In preparing and drying same follow carefully the directions. (See U. S. Department of Agriculture Farmers' Bulletin 841.)

Storing: Give directions for storing dried products. Store in paper bags and show paper cartons in which products may be stored.

(*b*) *Methods of drying.*—The process of drying vegetables and fruits is a simple one and can be done in the average home by the housewife. A uniformly dried product is desired and can best be secured by using a drier or evaporator constructed so that heated currents of air pass over the product as well as up through it, gathering the moisture and passing away. The movement of the current of air induces a more rapid and uniform drying.

Vegetables and fruits can be dried in an oven, in trays or racks over the kitchen stove, in a specially constructed drier, and, where there is electric current, by the newly devised method of exposing trays of the material to be dried to the air current from an ordinary electric fan. There are small driers on the market which give satisfactory results. The small cookstove driers or evaporators are small ovenlike structures, usually made of galvanized sheet iron or of wood and galvanized iron. They are of such a size that they can be placed on the top of an ordinary wood or coal range or a kerosene stove. These driers hold a series

of small trays on which fruits or vegetables are placed after being prepared for drying. Portable outdoor evaporators are especially convenient when it is desired to dry as much as 10 bushels of fruit or vegetables per day. They are usually constructed of wood except the parts in direct contact with the heater. The homemade dry kiln used in some sections of the country can be cheaply and easily made of brick and stone. Sun drying is only satisfactory in very dry climates. If done, every precaution should be taken to protect the vegetables or fruits from dust and insects when exposed to the sun.

If drying is done in a cookstove oven, leave the oven door ajar. Frequently note the temperature of oven. Trays for use in the oven can be made by using a convenient sized piece of galvanized wire screen and bending up the edge 1 or 2 inches.

It is important to know the temperature of the heat in the drier and this can not be determined very accurately except by using a thermometer. An ordinary chemical thermometer can be suspended in the drier. If a thermometer is not used, the greatest care should be given to the regulation of the heat. The temperature in the drier rises rather quickly, and the product may scorch unless close attention is given. The temperature for drying should be rather low to prevent scorching the product. For most vegetables, after surface moisture is removed, begin drying at a temperature of 110° F. Increase temperature gradually from 110° to 145° F. and complete drying in 2 or 3 hours. The time required for drying vegetables varies. However, it can easily be determined by a little experience.

(*c*) *Dried vegetables.*—As great care should be given to the selection and preparation of vegetables for drying as for canning. To secure a fine quality of dried products, much depends upon having the vegetables absolutely fresh, young, tender, and perfectly clean. Wash all vegetables and clean well. If steel knives are used in paring and cutting, have them clean and bright, so as not to discolor the vegetables.

After vegetables are prepared properly they are blanched—that is, they are plunged into boiling water for a short time. The blanch gives a more thorough cleaning, removes the strong odor and flavor from certain kinds of vegetables, and makes them more flexible. This allows the moisture in the vegetable to evaporate more quickly and uniformly. Use a wire basket or cheesecloth bag for blanching. After blanching the required number of minutes, drain well and remove surface moisture by placing vegetables between two towels or by exposing to the sun and air for a short time.

The vegetable thus prepared is spread in a thin layer on the trays of the drier. The material should be stirred or turned several times during the drying in order to secure a uniform product.

(*d*) *Dried fruits.*—In very dry climates fruits are usually dried in the sun. Most fruits dried in the sun discolor unless especially treated. For drying fruits in small quantities for home use the small drier is much more satisfactory. On very hot, dry days fruits may be dried in the sun until surface begins to wrinkle and then finished in the drier. Only fresh, ripe fruits should be used.

Before spreading fruit on the trays of the drier, line the tray with wrapping paper or cheesecloth. There is a possibility of the acid of the fruits acting upon the zinc. After drying cool quickly, as fruit when cooled slowly shrivels and looks unattractive.

The ideal moisture content of dried fruits is about 23 per cent. The ability to judge accurately as to when the fruit has reached the proper condition for removal from drier can be gained only by experience. When sufficiently dried it should be so dry that it is impossible to press water out of the freshly cut ends of the pieces, and so that it will not show any of the natural grain of the fruit on being broken, yet not so dry that it will snap or crackle. It should be leathery and pliable.

(*e*) *Storing dried products.*—When vegetables are first taken from the drier, if completely dried, they are very brittle. They are more easily handled and are in better condition for storing if allowed to stand one to three hours to absorb enough moisture to make them more pliable before putting into bags or storing otherwise. If it is not convenient to store products immediately and they are allowed to stand several days, just before storing they should be heated to 160° F. to destroy any insect eggs that might be on them. Care should be taken not to heat the vegetables higher than 160° F.

Dried vegetables and fruits should always be stored in moisture-proof containers and in a dry place free from dust and dirt. The best container is a tin box, bucket, or can fitted with a perfectly tight cover. Perhaps the most convenient and cheapest container is the small paper bag. A small amount should be put in each bag, just enough to use for one or two meals. This will prevent the opening of any dried product that can not be consumed in a short time. The upper part of the bag is twisted to form a neck. The neck is bent over and tied tightly with a string. The entire bag is then painted with a coat of melted paraffin, using a small brush or a frazzled end of a piece of rope. This makes the bag practically moisture and insect proof. To protect further from insect ravages, pack the bags, after labeling, in a tin container with a tightly fitting cover. A large number of bags may be stored in an ordinary lard can. A glass jar with a tight seal is a good container for dried products. Paraffin-coated paper containers of various sizes can be found on the market. If such containers are used, they should also be stored as just suggested for the paper bags.

All dried products should be examined occasionally. Upon the first appearance of insects, spread thin layers in the sun until insects disappear; then heat at a temperature of 160° F. and re-store carefully.

V. PRESERVATION OF FRUITS AND VEGETABLES BY FERMENTING, SALTING, AND VINEGAR PICKLING.

(*a*) *Demonstration.*—By arranging materials a few days in advance it will be possible to exhibit both the fresh fruits or vegetables and those partly through the fermenting or pickling processes. These materials, together with the equipment, will emphasize these inexpensive and reliable methods of preservation which are too little practiced.

(*b*) *General statement.*—The preservation of food products by fermentation has been practiced for centuries, and in Europe many fermented substances are well-known articles of food. In this country, however, sauerkraut and dill pickles are practically the only foods frequently preserved in this manner. Salted vegetables are prepared to some extent in this country, although the method of salting is more commonly used with meats and fish. Vinegar pickling is well known in all parts of the country. A number of vegetables may be preserved by fermenting and salting, and, when properly prepared and stored, they will keep for a

long time. These methods of preserving foods can not replace canning or drying, but have certain advantages, chief of which are the following: Containers may be used for storing the vegetables, such as wooden kegs, stone crocks, or large glass bottles, which are not adapted to canning; no sugar or fuel is required in the fermenting or pickling of vegetables, which is an advantage so far as cost is concerned; and, owing to the shortage of tin and glass containers, these methods of preservation are especially well worth considering at this time.

(*c*) *Fermenting of fruits or vegetables.*—The method of preserving fruits and vegetables by fermentation is perhaps best illustrated by the method of making sauerkraut in the home, which is given in the following paragraphs:

1. In making sauerkraut for home purposes the outer green leaves of the cabbage should be removed, just as in preparing cabbage for boiling. In addition, all decayed or bruised leaves should be discarded and the core removed. Cabbage may be shredded by one of the hand-shredding machines sold upon the market for such purposes, or, if such an instrument is not available, the heads may be cut into thin slices with a large knife. The core is omitted when machine for shredding is not available, because it is difficult to shred it finely enough with a knife. The shredded cabbage should be packed immediately into a perfectly clean, water-tight receptacle, such as a cider or wine barrel, keg, or tub. Four or five gallon earthenware crocks are recommended for family use. After opening this quantity of sauerkraut it can be used up before spoilage sets in.

As the cabbage is packed into the barrel or crock, salt in the proportion of one pound of salt to 40 pounds of cabbage should be added and distributed evenly throughout the cabbage. Experiments have shown that approximately two and one-half pounds of salt to each hundred pounds of shredded cabbage gives the best flavor to the resulting kraut. When the barrel or crock is nearly full, the cabbage should be pressed down as firmly as possible and covered with a clean board cover. It is advisable but not essential that a clean cloth be placed over the cabbage before the cover is put into place. The salt soon extracts a considerable amount of the cabbage juice from the cabbage, and a sufficient weight of clean brick or stone should be added to cause the brine to rise above the wooden cover. Care should be taken not to use lime or sandstone for weights, for the acid produced by fermentation attacks the lime and destroys the keeping quality of the brine. Tubs and covers made of yellow or pitch pine should not be employed, because such woods cause a disagreeable flavor.

The barrel or crock is now set aside and fermentation is allowed to proceed undisturbed. If the weather is cold or the product is stored in a cool cellar it may take three to five weeks for the fermentation to be completed. If placed in a warm room fermentation may be completed in 10 days to two weeks. As soon as fermentation starts a foam appears on the surface of the brine. This is soon followed by a film which develops into a heavy scum, if allowed to remain. The scum should be removed by skimming as often as it forms, every day if necessary. This scum, is really a mold growth which feeds upon the acid in the brine, and if allowed to grow undisturbed, soon destroys both brine and kraut. As soon as gas bubbles cease arising, the scum should be again removed, if any has formed, and a layer of hot melted paraffin about one-fourth to one-half inch thick should be poured upon the brine. If the sauerkraut

is made during the fall and stored in a cool place, there is no absolute necessity of a layer of paraffin, for the low temperature will prevent decomposition. No doubt the popular idea that sauerkraut made from early cabbage will not keep is based upon the fact that the fermentation of sauerkraut made from such cabbage occurs in warm weather, and the rapid growth of scum soon destroys both brine and kraut if the surface is not properly protected.

2. Covering the material: The surface of the fermenting material should be protected against spoilage. This may be done by placing between the vegetables and the board cover mentioned above several thicknesses of clean cheesecloth, or even a layer about 1 inch thick of clean beet tops, rhubarb, or grape leaves. In the case of sauerkraut clean cabbage leaves can be used.

3. Protecting the surface of fermenting material: If uncooked vegetables or fruits are fermented, there will also be more or less bubbling and foaming of the brine during the first stages of fermentation. After this ceases, a thin film will appear, which will spread rapidly over the whole surface and develop quickly into a heavy folded membrane composed of mold growth as explained. It is very important that this scum be prevented from forming, if the product is to be kept for a considerable time. One important characteristic of this scum is that it will not grow in the absence of air. The free oxygen of the air is absolutely necessary for its growth. Consequently the exclusion of air from the surface of the brine will entirely prevent the scum from forming. There are three feasible methods of excluding the air. The first method is to use an oil, like cottonseed oil, which floats on the surface and effectually prevents air from reaching the brine. Brine with a layer of liquid petroleum or cottonseed oil one-half inch thick on the surface will keep indefinitely. The only objection to liquid oils is the difficulty of getting at the preserved vegetables without getting them covered with oil, which it is difficult to remove.

The second method is to cover the surface with very hot melted paraffin. If the paraffin is sufficiently hot to make the brine boil when poured upon it, the paraffin will form a smooth, even layer before hardening. After solidifying it will effect a perfectly air-tight seal. Paraffin has, in comparison with liquid oil, the advantage of ease in handling, and of not coming in contact with the fermented vegetables when they are removed. Further, paraffin can be used over and over and thus the expense is small in the long run. If it becomes dirty, it can be heated very hot and strained through cheesecloth or a thin layer of cotton. The one disadvantage with paraffin is that the development of gas below the layer will break the seal. If the paraffin breaks, it should be removed, remelted, and replaced. Before adding paraffin the containers should be set where they will not be disturbed until ready for use. Any attempt to move them may break the seal and necessitate remelting and resealing.

If cottonseed oil or paraffin is used to cover the brine, it is advisable so to adjust the amount of brine used and weights on the cover that the brine comes up to but does not go over the cover. In this case only the brine exposed between the cover and sides needs to be oiled or paraffined, thus saving covering material.

The third method is to pack the barrels as full as possible and replace the head. In using this method of fermentation with beets, cucumbers, chayotes, or string beans, fill the barrels as full as possible, add cover

and weights. Let stand for 24 hours to allow the initial gas to escape and head up tight. Bore a 1-inch hole in the head and fill the barrel full with brine. There should be no air space in the barrel. Allow the barrel to stand until bubbling has stopped. Add more brine if necessary and plug the vent tight. If the barrel does not leak, fermented products put up in this manner will keep indefinitely.

4. String beans may be preserved by a slight modification of the method used for sauerkraut: Remove the tip ends and strings from the beans, wash, drain, and weigh them. For each hundred pounds of beans weigh out 3 pounds of fine salt. For smaller amounts use the same proportion of salt (3 per cent by weight). Pack the beans in the keg or crock in layers, sprinkling each layer with the fine salt, using just enough so that the amount weighed out will suffice to pack the whole quantity of string beans. Cover and ferment as described for sauerkraut.

5. Cucumbers, chayotes, and beets: These vegetables are best preserved by fermenting them in a weak salt solution, as the salt will not extract sufficient water from them to form a brine. Wash the vegetables and pack them whole in a keg or other container. Pour over them a weak brine, cover with a board, and weight, and set aside to ferment as in the case of sauerkraut. The brine is prepared as follows: Dissolve 1 pound of salt in 10 quarts of water, stir until the salt is dissolved and then add 1½ pints of vinegar.

(*d*) *Salting fruits and vegetables.*—Vegetables, like dandelions, spinach, kale, beet greens, and string beans, may be preserved by packing with a sufficiently large quantity of salt to prevent any fermentation or development of bacteria. Wash, drain, and weigh the vegetables. Weigh out also a quantity of fine salt equal to one-fourth the weight of the vegetables. Pack the vegetables in a clean keg, stone crock, or other container in layers about 1 inch thick and sprinkle each layer heavily with salt. Cover the material with a clean cloth and a round board as described for sauerkraut, add a weight, and set aside. When ready for cooking, the salted vegetables should be soaked several hours in clean water and cooked in the same way as one would the fresh vegetables.

(*e*) *Preserving fruits or vegetables in vinegar.*—Pickled vegetables or those preserved in vinegar are of three general types: Those preserved whole in vinegar alone (sour pickles), those in which spices or sugar and spices are added to the vinegar (sweet or spiced pickles), and the chopped vegetables, such as chowchow, ketchups, etc., which contain vinegar. The acetic acid in the vinegar preserves these materials by preventing the growth of yeasts, molds, or bacteria, which would cause the food to spoil.

NOTE.—The question of fermenting, salting, and pickling of vegetables will be considered in a bulletin soon to be issued by the Department of Agriculture.

LESSON IX.

FUNDAMENTALS OF AN ADEQUATE DIET.

WHAT CONSTITUTES AN IDEAL DIET-INTRODUCTION.

An ideal diet must include foods which supply in proper amount the substances which the body requires for building and repair, for maintenance of normal body functioning, and for meeting energy requirements. The public is being strongly urged to produce more food and to eliminate waste on the farm, in transportation, in market, and in the home. To do this wisely necessitates a knowledge of food, not only in order that the diet may be adequate but that stress may be laid upon the kind of food saving which counts and which safeguards the diet while it keeps in mind the special needs of the present time.

In the older discussion of food and dietary requirements stress was laid upon protein, ash, and energy, because these were the aspects of diet on which information was available, and these still are fundamental to the discussion. Furthermore, much stress was laid on race experience and other empirical knowledge of food and dietetics, and the general conclusion was reached that a truly varied diet is essential to health and well-being. Within the last few years research has added new chapters to our knowledge of dietetics, which has not only broadened our vision but has provided an explanation for things that were hitherto known only empirically.

THE IMPORTANCE OF THE NEWER FOOD CHEMISTRY IN DISCUSSING DIETARY PROBLEMS.

This lesson discusses dietary requirements and lays particular emphasis upon the relation of the newer data to dietary problems and shows how the new information adds to possibilities of exact discussions and also systematizes and gives reasons for older empirical and experimental knowledge. Attention is also given to a number of foods whose importance in some cases was recognized long before the reasons for it were known, and others which gain a new importance from the new knowledge.

At the beginning one must appreciate the fact that diet is a complex thing and that satisfactory nutrition (whether it be attained as a result of the wisdom gained by race experience or by the application of laboratory research) means suitable combinations of foodstuffs in rational and adequate proportion. It should be obvious that this end can not be attained by following some simple admonition such as "Eat whole grain rather than its mill products," or "Live only on fruits and vegetables."

The several classes of foods as they occur in nature (such as milk, eggs seeds, and leaves) possess certain peculiar dietary values. Some may be perfect for special purposes, as, for instance, milk for young children. Under other circumstances a given food may be a very poor one. It is possible for foods to be unsatisfactory in different ways. Experience and experiment both show that, if properly combined, the deficiencies of one

food may make good those of another, while, if improperly combined, the opposite may be the case, but the explanation is supplied by experiment. The true nature of each food, its weakness as well as its elements of strength, being understood, the determination of the proper combinations of foods (to supply the body with building materials and with substances needed for their efficient use and with energy with which to carry on body processes and external muscular work) becomes a question of simple logic. Such considerations lead to a realization of three things: (1) That even when man or farm animals are supplied with an abundance of perfectly wholesome foods, it does not necessarily follow that they will grow well or remain in good condition; (2) that on the basis of empirical knowledge it is very commonly but not always possible so to combine foods that growth, health, and production are properly maintained; and (3) that the newer knowledge of food chemistry shows upon what success or failure in dietetics depends and makes it possible to meet dietary requirements with a certainty which was not possible on the basis of empirical knowledge only. To cite an illustration: the newer chemistry shows why certain fruit juices are so important in infant feeding.

It happens not infrequently that, owing to one circumstance or another, human beings in various parts of the world have, without realizing it, made serious errors in their diet. With the realization of the error has sometimes come its correction by empirical knowledge. For instance, in Japan at one time the army and navy were practically incapacitated, the soldiers and sailors suffering from a disease known as beriberi. Careful study of the diet led to the conclusion that greater variety was needed, and when this was introduced, chiefly by substituting other foods for rice, the health of the men became normal and beriberi practically disappeared. Instances of what are now called "dietary diseases as a result of malnutrition" are scurvy and rickets and the not so easily characterized diseases frequently observed in school children, such as underweight, anemia, dullness, and persistent feeling of fatigue. Such symptoms may be due to the presence of parasites, particularly in the alimentary tract, but very commonly are due to a quantitative or to a qualitative dietary deficiency. In these cases empirical knowledge has been a help, but it remained for the newer food chemistry to determine what the dietary deficiencies were and how they may be remedied.

To cite another instance, The United States Public Health Service has practically demonstrated that pellagra, a disease existing in the United States and other countries and prevailing here particularly in regions of the South, and which has long been associated in some unexplained way with diet, is the result of a dietary deficiency, due in part to a method of handling food materials which injures their specific qualities, the situation being further aggravated by a limited range of foods. In this case both explanation and remedy awaited the knowledge which the newer food chemistry has placed in the hands of the investigator.

There are problems which empirical knowledge has not solved; for instance, in that part of Montana drained by the Yellowstone River alone the live-stock industry has been practically ruined because young animals can not be raised. In the spring of 1916 about a million lambs and a million pigs died. An equally serious condition exists in the State of Washington, where newborn pigs, calves, and colts die in enormous numbers. The hope of overcoming this enormous agricultural loss lies in the application of methods and facts provided by the newer food chemistry.

When, as at present, we face a food emergency, there is greater need than at ordinary times for carefully planning our diet so as to insure physiological safety and also provide for the efficient production of work which the body machine must perform. Fortunately it is possible to give very definite and specific advice which, if followed, will be of the greatest benefit to the public. In order to understand why certain diets are safe and others are unsafe, it is necessary to know the factors upon which adequacy in diet depends. These are:

(*a*) *Proteins in proper quantity to supply nitrogen in the forms needed by the body.*—Proteins are the most important constituents of body tissues, including the muscles and internal organs, and protein foods are especially needed for their nourishment. The exact amount of protein required depends upon the age and size of the person, as does also the kind of protein needed. It is usually estimated that 90 to 100 grams (2.86—3.5 ounces) obtained from a varied diet gives a safe standard for an adult man at a period of full vigor, weighing 150 pounds, and that 70 grams (2.5 ounces) is needed for a woman in full vigor, of average size.

(*b*) *A suitable amount of energy.*—This is usually estimated to be 3,000 calories of energy for a man in the period of full vigor, weighing 150 pounds, and 2,400 calories for a woman of average size, when moderately active muscular work is performed. Protein, fat, and carbohydrates are all used by the body to yield energy. Protein alone can supply nitrogen for body tissue building and repair. Its cost is relatively high and for this reason, if for no other, it should not supply over one-eighth of the total energy requirement. On the other hand, carbohydrates and fat, neither of which supplies the body with nitrogen, are the important sources of energy. The carbohydrates (especially sugar and starch) are usually the most abundant sources of energy in the diet, and for reasons of economy it is well that they should be so. However, fats, though they need not be so abundant, are essential, a certain amount of particular kinds being required for physiological reasons as well as to make the diet palatable and to insure the provision of a certain substance described below (*d*), which occurs dissolved in some fats. The amount should probably be from 40 to 60 grams (1.42 to 2.12 ounces) of fats purchased as such. As sources of energy fats supply two and one-fourth times as many calories per given weight as do carbohydrates.

(*c*) *Mineral substances.*—An adequate diet must likewise contain a suitable amount of certain inorganic substances (phosphorus, calcium, magnesium, iron, potassium, sodium, sulphur, and others).

(*d*) *Two chemical substances whose nature is still entirely unknown save that one is soluble in water and the other in fats.*—The water-soluble substance is present in nearly all common foods. It is not found, however, at least appreciably, in polished rice, commercial starch, pure sugar, or in fats of either animal or vegetable origin. The fat-soluble substance is less widely distributed. It is found in milk, and especially in the milk fat, egg yolk, meat, particularly organs and the fat around them, and in some other animal foods, and in the green leaves of plants, but is not found in the seeds save in the germ, or in the oils such as olive oil and those from the oil-bearing seeds as cotton seed, etc. That such substances are important in the diet is clear from the fact that it was a lack of the water-soluble substance in the diet that caused the disease beriberi in the case of the Japanese soldiers and sailors, and a lack of

the fat-soluble substance which, in laboratory experiments, causes the failure of young animals to grow when maintained upon rations deficient in this substance.

(*e*) *Effect of diet on processes of digestion.*—To insure normal nutrition the diet must be of such a character that digestive processes progress normally. The food must not remain for too short or too long a time in the stomach—a factor influenced partly by the amount of fat in the food—nor should it undergo fermentation.

The digestion in the intestine is influenced by such factors as the bulk of the diet, the presence of organic acids (as citric) in the food, of mineral salts, the character and amount of cellulose (crude fiber) in the diet, the amount of fermentable sugars eaten, the character and amount of fat in the food, and the kind and extent of bacterial action.

That food may influence the digestion favorably is shown by the laxative effect of bulky foods, plant acids, and mineral salts. That it may influence it unfavorably is shown by the undue irritation of the intestinal tract by coarse mechanical condition of food or undue gas formation, as, for instance, from the hemicellulose of legumes.

That the bacterial flora of the intestinal tract may have a favorable or unfavorable action upon digestion and that the character and extent of activity of the intestinal flora is influenced by the food is known, but this is a subject which is as yet not clearly understood, although it is a matter which is being given attention by bacteriologists. A fundamental principle of the hygiene of food preparation is that food should not carry into the body those bacteria producing "food poisoning," which interrupt digestion and may result in serious illness.

Such factors as those enumerated have an effect upon the frequency and regularity of evacuation, and this is a generalization which must not be overlooked.

(*f*) *Other needs of the body.*—When considering what may be termed "the material needs"—that is, the importance of an adequate amount of substances required for body growth, health, maintenance of condition, and "energy needs"—mention should also be made of other aspects of diet important but on a different plane, such as appearance, flavor, and other things which contribute to the palatability of the diet. Though such factors may not influence materially the thoroughness of digestion, they do play a part in insuring a regular and normal sequence of digestive processes and are very important to satisfaction and a feeling of well-being.

FOOD AND BODY PROTEINS.

In the case of the food problem, as a whole, recently acquired knowledge has considerably modified older views, but it is chiefly with respect to the foods which supply characteristic building materials (protein and mineral substances) and the recently discovered growth-stimulating and regulatory substances, as yet unnamed but identified by the fact that one is soluble in fat and the other in water, that the newer food research has to do.

With respect to protein, investigations have made it clear that some protein foods will induce normal body growth while others will not. For instance, experiment has shown that when an animal is fed a single cereal grain, such as wheat, oats, or corn, it does not thrive, though the protein provided is theoretically sufficient in any one of these grains when according to chemical analysis, the grain contains 10 per cent protein

and the amount eaten provides a quantity supposedly sufficient for body requirements. There remains the possibility that the proteins of the grain are not of the right quality for body growth, and such has been found to be the case.* To those not familiar with chemistry the question naturally arises, How can a protein sometimes be of good quality and sometimes of poor quality? The answer is clear and simple. The protein molecule is complex and may vary within wide limits and still possess certain common characteristics. It may be likened to a chain, longer or shorter, made of links which differ in number, kind, and arrangement. We can think of chains made up of different sorts of links or of chains in which the links are the same but arranged in different sequence. According to this analogy proteins of both animal and vegetable origin (such as the protein substance of muscle and the gluten of wheat) are made up of the same kinds of links, but the links are not arranged in the same order. The links which make up the protein chain are amino acids, and the protein molecule accordingly represents a union of different amino acids which may be arranged in many ways, the number present and the arrangement determining the specific quality of a particular protein. [An amino acid contains the radicle NH_2—.]

From experimental evidence it appears that there are 18 different kinds of links (amino acids) in most of the food proteins of interest in such a discussion as this, but that there are food proteins which lack one, two, or three kinds of links.

The growth of protein tissue (muscles, liver, kidney, blood, etc.), which is made up of protein chains, is obviously dependent upon a supply of a proper amount of the required kinds of links; otherwise, the needed protein chains, to continue the analogy, could not be formed.

The processes of daily life cause the breaking down of a certain amount of the living tissue of the protein-rich type, and if the body is to be maintained, this must be replaced or repaired from the protein which the food supplies. This renewal and repair process in the body tissue may be likened to replacing worn or broken links.

The body needs links of different kinds, and so it is essential to proper nutrition that the food be so arranged that it provides enough of all the kinds of links which are needed. The linkage of food proteins is not identical with that of body proteins, and so it is necessary that the chains supplied by the food should be unlinked and recombined in new form. The unlinking is accomplished by the processes of digestion. The body then selects from the links and rearranges them into new chains according to its needs.

When a protein, such as that present, for instance, in wheat, corn, or oats, is broken down and does not supply all the links which the body needs, it is obvious that it is of poor quality. When the protein of milk or eggs, for instance, is broken down and supplies all the kinds of links which are needed, it is obvious that it is of good quality. When two proteins used together in right proportion supply all the links that are needed, it is evident that the combination is of good quality, as is, for instance, the combination of bread and milk. From the foregoing it follows that the technical discussion of food with reference to protein must rest upon a knowledge of the character of the different food proteins and their structure and take into account the possibilities of combinations of food in such a way that the diet may provide for all the body protein needs.

MINERAL SUBSTANCES.

In addition to being essential for body-building tissues, mineral substances are important for a variety of physiological purposes. As a result of recent research on the mineral constituents of food and their functions in nutrition, broader generalizations can be made than was hitherto the case.

The subject is one which is difficult to treat briefly, and so information should be sought from an adequate summary, such as that recently published by Forbes.[1]

WATER-SOLUBLE AND FAT-SOLUBLE DIETARY ESSENTIALS.

With respect to recently discovered dietary substances, which are discussed under (d) and called, for convenience, "fat-soluble A" and "water-soluble B," there are many things which are not understood, but nevertheless there are important generalizations which can be made. An account of the growth and development of this work, its bearing upon nutrition, and conclusions which can be drawn, will be found in a paper recently published by McCollum.[2]

In the following pages some generalizations are made regarding the dietary properties of different foods, particularly with reference to protein, mineral constituents, and the fat-soluble and the water-soluble dietary essentials.

THE DIETARY PROPERTIES OF ROOT VEGETABLES.

The two most common root vegetables used in the United States are the potato and the sweet potato. They are rich in starch (the sweet potato in sugar also) and inorganic constituents. These tubers, however, are extremely poor in proteins and can not be used to the exclusion of protein-rich foods in the diet.

The ash constituents of the potato stand in quality between those of plant leaves and seed.

It is highly desirable that the diet should contain a slight excess of the basic or alkaline elements over the acid elements which foods supply when metabolized. In general, tubers supply alkaline mineral substances in relatively large proportion. Leaves also yield an alkaline ash, as does milk. On the other hand, seeds, including cereal grains, yield an acid ash as do also meats, fish, and eggs. Hence the logic of combining tubers and leaves with meats, fish, and eggs, which yield an acid ash, and of combining grains and their products with milk, which yields an alkaline ash.

THE DIETARY PROPERTIES OF THE GRAINS.

If the protein of a single grain is of poor quality and the grain is otherwise a complete food, an animal fed solely on the grain in question supplemented by a protein of good quality such as that furnished by eggs, meat, or milk, should theoretically thrive, for the deficient protein of the grain would then be supplemented by the other proteins.

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[1] The Mineral Nutriments in Practical Human Dieteties, by E. B. Forbes. Sci. Mo., 2 (1916), No. 3, pp. 282–293.

[2] Jour. Amer. Med. Assoc., 68 (1917), No. 19, pp. 1379–1386.

Many trials with different grains (laboratory animals being used as subjects) have shown that such combinations supplying, so far as protein is concerned, the needed protein links, do not make a ration which is much better than the grain alone. This is the case notwithstanding the fact that the food supplies enough energy in the form of starch (which is a common constituent of the grains) aside from that obtained from the several per cent of fat also present in the experimental ration. It may be taken for granted, then, that the trouble with these grains, from a dietary standpoint, does not lie in the carbohydrates and fats which they contain. Suspicion would naturally fall, therefore, upon the mineral elements of the grains with respect to kind and amount. A chemical analysis shows that each of the common food grains is poor in lime and in common salt, and experiments with animals have shown that these two inorganic constituents must be increased in amount before the grains become capable of supporting growth. But even when supplemented by both protein and mineral matter additions the grains can not properly nourish a young animal. Some other reasons for the dietary deficiency must be found and it has been discovered recently that the missing requirement is a minute amount of the substance soluble in fat, which is as yet unnamed[1] but for convenience is designated "Fat-soluble A," meaning a substance whose nature is unknown, but which is soluble in fat and which is so designated until such time when a suitable name is found for it.

Experiments showed that a grain ration properly supplemented by protein from another source and by the above-mentioned inorganic substance and further supplemented by a little milk fat or fat from the kidney, liver, or other organ of an animal, will serve as an excellent foodstuff for growth as well for maintenance.

A vast amount of human dietary experience and experiments in animal production have fully demonstrated that nutrition can not be attained with diets restricted to the seeds of plants.

It must not be inferred, however, that the cereal grains are poor foodstuffs. On the contrary they are excellent as far as they go, but in order to be entirely satisfactory they need to be supplemented by other foods which supply the constituents which they lack. This conclusion from laboratory experiments is entirely in accord with experience which has made cereal grains a part of the diet supplemented by green vegetables, fruits and milk, and other animal foods. The unwholesomeness of a restricted diet, largely cereal in character, is evident in the conclusion which has been advanced that the prevalence of pellagra in the southern United States at the present time is in great measure due to the practice of deriving the major portion of the diet from grains and their milled products. Advanced signs of pellagra appeared at the end of a five months' subsistence upon a diet restricted to such foods as white flour, corn grits, corn meal, starch, sirup, sugar, cabbage, collards, turnip greens, and sweet potatoes. The regular diet of thousands of the poor people of the southern States during the winter contains little besides corn bread, molasses, and a small amount of salt pork. After three or four months of such a diet large numbers of them develop pellagra. That the corn meal which is eaten has in itself nothing to do with the production of pellagra is evident from the fact that the disease occurs

[1] The name Vitamine is a name proposed by Funk for an essential body substance, but in the light of recent knowledge it has little general application.

with those who have not eaten corn products in the period preceding the attack. Corn rightly used is a wholesome foodstuff, and there is no warrant for the belief sometimes expressed that it is the cause of pellagra. It is the restricted character of the diet which is undoubtedly rendered unsatisfactory by several factors operating simultaneously, not corn or any other single food, which causes the disease. When the character of the diet is improved by doing away with an excess of alkali (baking soda) in cookery and by the introduction of a wider range of foods, including those like milk, meat, and eggs, which supply protein of the needed character as well as the needed ash constituents and water-soluble B, many of the milder cases of the disease recover.

DIETARY PROPERTIES OF BEANS AND PEAS.

The value of beans and peas has been somewhat overrated in the past. Used in reasonable quantities and suitably combined with cereal grains and milk they form perfectly wholesome additions to the daily diet, but the statement that we have so often seen that beans are a poor man's meat is misleading, and they should not be used in excessive amounts. One reason is that beans have none of the pleasing and characteristic flavor of meats; another that their proteins are of poor quality. In addition, there is a peculiar quality to most of the carbohydrates of both peas and beans, but especially beans, which leads to fermentation and gas production which may be excessive and harmful when these seeds are eaten in too liberal amounts.

Within certain limits the peanut, the cowpea and the soy bean, like the ordinary beans, may well be employed as regular constituents of the human diet, and recent experiments have shown that soy bean and peanut protein are of exceptionally good character. Peanut butter is ordinarily relatively expensive, as it is bought in small quantities in special containers. However, it is also sold in bulk and it is easily and cheaply prepared in the home with the proper type of meat hasher. Recently published articles give information as to methods of using soy beans [1] in home cookery. Similar data on peanuts [2] have also been published.

THE DIETARY PROPERTIES OF GREEN LEAVES.

Because of the character of his digestive tract, man can not live on leaf vegetables alone. Nevertheless, they are a very important part of his diet, experience as well as the experimental evidence having shown that they possess decidely different dietary characteristics from seeds and roots. The important differences are the facts that the leaves of plants contain two to six times as much total inorganic material as the seeds, and that they also contain a liberal amount of the fat-soluble dietary essential of unknown nature. So far as is known, the characteristic property of this fat-soluble substance is not destroyed by the heat in cooking, so leaf vegetables can be used either raw or cooked. The almost universal

[1] Soy Bean Cookery, Nell Beaubein, Jour. Home Econ., 9 (1917), No. 6, pp. 273, 274. How to Cook Soy Beans, Agr. Ext. Service, Univ. Wis. Circ. 79, 1917.

[2] Use of Peanuts on the Home Table, Jessie P. Rich, Bul. Univ. Texas, 1915 No. 13. How to Grow the Peanut, and 105 Ways of Preparing It for Human Consumption, Bul. 31, Exper. Stat. Tuskegee Normal and Industrial Institute.

craving for green vegetables is justified by their high dietary importance, as is the wisdom of a mixed diet which includes generous amounts of potherbs and green salads.

THE DIETARY PROPERTIES OF MILK AND MILK PRODUCTS.

Milk and milk products are very important foodstuffs and have a peculiar dietary value, as is evidenced by the fact that milk is a complete food for the young animal. Experience shows that after the period of exclusive diet has passed it is still a very desirable food for young children as well as for the adult. The fact that whole milk, skim milk, and cheese supply an abundance of protein is well recognized. It is equally well known that milk, butter, and cheese are important sources of energy. A study of milk protein shows that in character it is particularly valuable for building and repairing body tissues.

Milk, like the leaves of plants, yields an alkaline ash and is a very valuable source of mineral substances. The mineral salts of milk resemble in many ways the inorganic content of the leaves of the plants. A further reason for considering milk an important and almost indispensable foodstuff is that the milk fat is characterized by the presence of the unknown substance, designated fat-soluble A, which is so important in normal nutrition. These facts, taken together with its palatability and the numerous ways in which it can be used, justify the widespread belief that milk is an important food and that, wherever possible, it should constitute one of the articles of a mixed diet. There exists, therefore, an excellent supplementary value between milk and grains, and good results follow the consumption of milk and grain mixtures.

THE DIETARY PROPERTIES OF EGGS.

Eggs, like milk, provide the natural food of a developing animal and, as might be expected, it is found that they contain proteins of especial value for building and repairing body tissue. The yolk and white are very different in their characteristics. The yolk contains in addition to protein a considerable amount of fat. The egg furnishes important mineral substances which, with respect to the nature of residual ash, resembles meat rather than milk. Owing to their fat content, eggs have a fairly high fuel value. Another reason that eggs deserve the high place in the diet which is commonly assigned to them is the fact that yolk fat carries with it the important dietary substance fat-soluble A, hence their use in the diet even during the first year of the child's life.

THE DIETARY PROPERTIES OF MEATS.

Meats are readily assimilated and generally liked, and, rightly used, are wholesome foods. They contain excellent proteins and contribute to the energy value of the diet not only by their protein content but by the fat which they contain in larger or smaller amount. The character of their ash constituents and their content of fat-soluble A are only fairly good. The acid nature of their ash is readily counterbalanced by the alkaline ash secured in the ordinary diet by supplying potatoes and other vegetables and fruits, but not by supplying grains. Meats help to make good the protein deficiency of grains but do not entirely do so. Meats, however, have a peculiar quality which makes them of the greatest

importance as a regular constituent of the diet. This is their great palatability. That they are not essential in the diet for their energy or their protein content is shown by the experience of many who leave them out of the diet. If one wishes to do so the use of meats may be restricted to small amounts used to give flavor to vegetables and in the preparation of soups and gravies. Although it may be desirable on economic grounds it is not necessary on physiological grounds to so reduce the meat supply, for meat rightly used is not of itself harmful, as is shown by the diet of races living almost exclusively on meat and meat products. The importance of meat as a flavoring substance is dependent upon the fact that the proper course of digestion of food depends in great measure upon the pleasurable sensations which accompany eating and which we do not experience unless we eat tasty foods, and meats add to the flavor of foods. The American people do not eat rice, bread, or potatoes persistently in large quantities without rendering them appetizing by the addition of meat, of fish, or palatable gravies or meats eaten in combination with them. There is also evidence to show that meats and meat extractives are normal stimulants to the flow of digestive juices and have an important function in the diet in this way. From such evidence it is clear that results of experiments as well as experience show the wisdom of living upon a mixed rather than upon a limited diet and of including at least some meat as one of the foods used.

Fish is very similar to meat in its dietary characteristics.

THINGS TO BE REMEMBERED IN PLANNING THE DIET.

The general procedure in making up a diet is simple. First of all the diet must have sufficient protein and also enough of the ash constituents for building and repairing tissue and for other physiological purposes. It must also supply fuel-yielding foods in amounts sufficient to supply the body with energy needed for internal and external muscular work. In addition to these requirements it has recently been found that food must also supply two substances, one of which is designated as fat-soluble A, which is essential for growth, and the other, designated as water-soluble B, which is essential for the maintenance of normal body conditions.

There are two combinations of naturally occurring foods which will supply a sufficient amount of fat-soluble A to insure satisfactory results in growing animals.[1] One of these is a proper combination of cereal grains. tubers, and milk, and the other a combination of grains and green leaves. In feeding farm animals, good results are obtained by combining the grain with forage plants in the form of green pasturage. In human nutrition the combination of cereal grains, tubers, and milk is more satisfactory.

In human nutrition green-leaved plants are used very largely as potherbs and salads and it is a marked feature of the diet of the present day, as compared with earlier times, that such foods are much less a matter of season than they were in times before transportation, market gardening under glass, and the development of the storage industry and canning had made such products accessible all the year around instead of being very largely a summer foodstuff.

Since cooking apparently does not destroy the properties of the fat-soluble substance contained in green plants the use of potherbs should

[1] The Supplementary Dietary Relationships Among Our Natural Foodstuffs, E. V. McCollum, Jour. Amer. Med. Assoc., 68 (1917), No. 19, pp. 1379–1386.

be encouraged, as should household canning and drying. The use of larger quantities of green leaves as salad is also highly desirable.

The use of a dried leaf product like a meal, naturally suggests itself as a possibility. Some practical tests of interest in this connection have been made in recent times with ground alfalfa hay, the result being successful only in a limited way. More recently experimental work has been carried on at the University of Wisconsin with dried and ground alfalfa leaves (which unlike alfalfa hay have not undergone the characteristic hay fermentation), which gave interesting results. The dried and ground alfalfa leaf imparted a green color to the bread but did not materially affect the taste, provided only moderate amounts were used. If the admixture of dried and ground alfalfa leaf was greater than 12 to 14 per cent the bread had a bitter taste and was less palatable.

In this connection it is worth noting that alfalfa has been used to a considerable extent as greens, particularly in regions where it is a common forage crop.

The greatest factor of safety in the human diet is the regular use of milk, because of the protein and needed mineral matter as well as the fat-soluble A which is found in milk fat. Unfortunately, the milk supply is now inadequate for our needs. Statistics show less than one-half pint of milk per person per day is consumed in our larger cities. Very liberal use of milk in well-to-do households is one reason for this and another reason is that so much skim milk is wasted, notwithstanding the fact that it has practically all the food value of whole milk except the fat. Such conditions should be remedied in order that people of moderate means may have milk for their needs.

It is very difficult, under American conditions, to rear a child satisfactorily without milk. Each growing child should have not less than a glass of whole milk a day. Adults in cities should, for the benefit of poor children, use milk sparingly until the supply can be made adequate for the entire population. When the school lunch is part of public school work, the importance of milk, as one of the foods served, should not be overlooked. Its importance is particularly great where the undernourished school child is a factor.

Other sources of fat-soluble A, including the fats in liver and kidney and in suet and egg yolk should not be overlooked.

Meats have an extraordinary palatability and as the result of this and other qualities have a bearing upon the digestibility of the diet. Meats also are a source of the water-soluble B, essential in the diet for maintaining a body in normal condition. For such reasons at least moderate quantities of meat are to be recommended in the diet. Meats are evidently wholesome food but it should be clearly understood that they are not absolutely essential in the diet. When they are relatively high in price they become luxuries and the price may become so high as practically to exclude them from the diet of those whose incomes are limited. Such a condition has long existed in some parts of the world. From such facts it is clear that when economy must be practiced the diminished use of meat is one of the most obvious ways of beginning it. When meat is diminished, other protein foods should replace it in proper proportions. Fish, milk, cheese, and eggs naturally suggest themselves, as do legumes, such as beans, peas, peanuts, etc., and nuts. The nuts (excluding peanuts which are properly classed with legumes rather than with nuts), except where they can be procured for the gathering or at moderate prices, are

negligible in a general discussion, since the total annual production is so small, as compared with the world's supply of meat.

Owing to the fact that agricultural production is so diversified, the variety of human food is so great that it is not feasible to offer more than rough general statements as to how the food supply could be combined to provide a safe diet. The statements here made are intended to point out the characteristics of various foodstuffs, emphasizing particularly those that have to do with food properties which have been recently studied.

As a generalization, the following may be suggested as a guide for insuring good nutrition for the family.

In general, not more than 30 to 40 per cent of the total average protein of the diet should be secured from meat, fish, poultry, game, milk, and eggs taken together. Approximately 25 to 33⅓ per cent of the total protein should be taken from cereal grains, such as wheat, oats, barley, rye, corn, and rice; and the remainder from root vegetables, such as potatoes, radishes, beets; legumes, such as peas, beans, peanuts, lentils; and such succulent vegetables as "greens" or pot-herbs, green salad plants, cabbage, cauliflower, collards, and other similar garden vegetables, and from fruits and nuts.

In order that adequate provision for the substance designated as water-soluble B may be made, it is important that the diet should contain the food substances in which this is most abundant. These include the wheat bran and germ [the corresponding layers of other cereals], meats, legumes, egg yolk, succulent vegetables, milk, and probably all fruits, although this has not yet been definitely settled. From the above it is apparent that the housekeeper has some range of choice in planning her diet to include the water-soluble B. If it is convenient for her and according to the tastes of the family, she can make sure that she secures these needed substances from the outer layers of cereals, by using entire wheat or unbolted corn meal in bread making, by giving preference to the unpolished or brown rice, or by increasing the use of breakfast cereals which are made from the whole grains. If she prefers, however, she can place her main dependence upon fruits and vegetables and not overlook the fact that meat is also a source of water-soluble B.

Fat-soluble A should be provided by a liberal use of green vegetables and milk and its products, not overlooking the fact that organ fats as suet are also useful. Of these, milk is of special importance and almost indispensable in the diet of children.

Mineral substances are present in all foods to some extent, with the exception of such foods as refined sugar, purified oils, and pure starches. The proportion is much greater in vegetables and fruits than in other foodstuffs and it has been thought that we should chiefly depend for mineral substances upon them and upon milk which also supplies in good proportion inorganic nutrients.

In the planning of the diet one should remember that starch and sugars, as they occur in nature or as they are marketed in purified form, and fats, as they occur in meats, milk, cheese, etc., or marketed in the form of vegetable oils or culinary and table fats are the important sources of energy in the diet. The diet, as a whole, must be so arranged that enough energy-yielding food for body purposes is provided. The chief reliance will be placed on starch and sugar.

For teaching the art of diet planning, as distinguished from the technical study of the subject (and often this is all that there is opportunity to do), another generalization can be made. This is, that the diet should

be so arranged that it contains, in reasonable amounts, representatives of the following groups [1] into which foods may for convenience be divided: (1) Green and succulent vegetables; (2) meats, milk, eggs, and other typically protein foods; (3) cereal grains and their products; (4) sugars, including those naturally occurring in sweet fruits, fresh and dried; and (5) fats, including milk fats and organ fats since they have special importance.

In order that one may partake of a varied diet in which the various groups are rationally represented, proper dietary habits are very important as are also wise food selection, and good cookery. Good food habits should be taught in youth. If they have not been acquired then, a special effort should be made to acquire them in later life. As an aid to this such material as is included in this paper is important.

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[1] U. S. Dept. Agr. Farmer's Bulletins 808, 816.
C. F. Langworthy. Sci. Mo. No. 2, 1916; No. 3, 294–306.

LESSON X.

GENERAL.

I. *The program of the national food administration is centralized nationally for making plans, but decentralized into State organizations for carrying out the plans.*

1. The national food administration, Washington, will—

(*a*) Continuously study the needs of the whole country as regards food conservation, and keep informed as to the international situation.

(*b*) Announce from time to time the national program of food conservation.

(*c*) Receive the pledge of the individual housekeeper to serve in the food administration.

(*d*) Receive the pledge of all others desirous of following out the program of the food administration.

II. *State organization.*—The food administration direction will be carried out in each State through—

(*a*) A Federal food commissioner, to be appointed by the President, who will have general charge of Federal food activities within the State.

(*b*) A home economics director, also appointed from Washington, to cooperate closely with the Federal food commissioner.

The Federal food commissioner and the home economics director will—

(*a*) Stimulate and coordinate the various agencies within the State, but will not create any new agencies, unless there are no suitable foundations on which to build.

(*b*) They will be kept advised regarding the national situation and will establish working relations with the existing local and State agencies, planning cooperation for food conservation work with the various State organizations associated with the United States Department of Agriculture and the College of Agriculture of the State; the public-school system; the organized special committees on food conservation such as the State council of defense, etc., and the State representatives of the Women's Committee of the Council of National Defense.

The home economics director will, with the cooperation of the Federal food commissioner—

(*a*) Arrange for the official program for the State relating to home economics, adjusting the national food conservation program to meet local conditions.

(*b*) Use all means desirable to reach the individual housekeeper for this purpose.

(*c*) Be the center of information on the food conservation program for individuals and local organizations.

The Federal food commissioner may receive and publish weekly reports on results in food conservation achieved by various State or neighborhood organizations, but not give directions that conflict with the national program, except by special sanction.

III. *The plans of the cooperative extension system of the United States Department of Agriculture, and the State agricultural college, for working with the food administration on food conservation.*

As the instructions of the national food administration regarding food conservation must be largely carried out through the Federal food commissioner, cooperating with the State committees on food, the cooperative extension system of the United States Department of Agriculture and the State agricultural college will use its organization in each State to help bring the practical directions for food conservation to the individual home, and the State organization will utilize the cooperative agricultural extension service as its chief agency in problems of agriculture and home economics. This organization already exists as an agency for popular instruction in agriculture and in home economics, carried on by the cooperation between the United States Department of Agriculture, the State college of agriculture, and the local community. In each State this is under the administration of the director of extension work at the State agricultural college. Under this director are extension specialists operating from the college throughout the State, county agricultural agents (men), and home economics demonstration agents (women) in many counties. It is expected that women home economics agents will also soon be located in the principal cities. These agents may often be secured by local organizations for demonstrations and lectures, and they can furnish national and State publications. Apply to the agents in your county or city, or to the extension director at the college.

The cooperative extension system, which is already effective in its local work in over 1,400 counties, is being extended as rapidly as possible, and national war emergency funds will probably soon be available for these purposes; so that it is expected that every community may ultimately be reached by its men and women, State and local agents. This whole system will be asked to cooperate most closely to help in making the national food conservation program effective. Individuals interested in aiding their local communities, whether urban or rural, to form definite organizations for extension work, should immediately consult the extension director at the State agricultural college. In many cases they will find plans under way for their community, in which they may find an opportunity to cooperate. In other cases they may be able to help bring the extension teaching movement into their community by developing the local cooperation necessary to secure local agents. The extension system has well-tried methods of reaching the home by means of demonstrations, exhibits, lectures, publications, personal conferences, organized groups for study, canning clubs, community canning plants, and other agencies, and where it can be brought into a local community it will be a most effective popular method of work for food conservation.

In each State there has been set up by the woman's committee of the National Council of Defense a woman's committee with a chairman to coordinate the work of the organized women of the State. In all plans for new organizations throughout the State she should be consulted in order to avoid confusion and duplication of effort.

IV. *Local action with local organization, under general control of the organized forces within the State, wherever feasible, is desired in every community, so that every housekeeper in America shall—*

(*a*) Register her food conservation pledge on the official pledge card to be secured from the State food committees or elsewhere, and send it in to the national food administration, Washington, D. C.

(*b*) Carry out in her own home the practical suggestions regarding food conservation in the program.

(*c*) Keep in touch with the later proposals made from time to time through the Federal food commissioner and carry them out in her home.

(*d*) Make a careful study of the food substitutes which we have available so as to save the staples—especially wheat, meat, fat, and sugar—which we need to ship to our allies to win the war and save our form of democratic government.

Local action for food registration and for forming neighborhood groups for food conservation can be initiated by those who have read these lectures and by other patriotic individuals, aiming in such efforts to register our women with the national food administration and to inform them of its plans. In starting a formal local organization for food conservation, however, individuals should first consult their State organizations and the extension director at the State agricultural college.

The State food committees and the director of extension service, State agricultural college, will give detailed advice suitable to your State for organizing community work for food conservation. Those reading these lectures are urged to communicate with these officials and take steps to help in their local communities, but some suggestions are offered here in order that each may at least pass on to neighbors and others the essential points in the food conservation program, and by doing this much each may render a real patriotic service.

1. *How to start an informal food conservation group.*—(*a*) Make full notes of the lectures on food conservation to use as a basis and secure additional bulletins on food conservation from the director of extension service, State agricultural college.

(*b*) Invite neighbors and others to a food conservation meeting at your home or other convenient meeting place; or secure the interest of local groups of women who are already organized in churches, clubs, granges, lodges, and other societies. See that all members of the group have signed food conservation pledge cards and sent them in to the national food administration, Washington, D. C.

(*c*) Decide on one definite problem to study at each meeting: Substitutes for meat, or the eating of perishables so that staples may be sent to our allies, or the possibility of using local foods as substitutes for transported foods, or canning, drying, etc.

(*d*) Prepare yourself carefully to lead the meeting, unless you can find a better-equipped leader. Make detailed preparation.

(*e*) At the meeting read selections from lecture notes and bulletins; discuss; have sample dishes cooked to exhibit; agree to try making dishes in individual kitchens (have a practical aim, something to do); report results at the next meeting.

(*f*) Repeat this plan with as many groups as you can.

(*g*) When practicable, have the informal group developed into an organization for wider community service and connect with the extension

system of the State agricultural college, or with work being done under the auspices of organized neighborhood groups or of the public schools.

2. *How to make an official community organization for food conservation.*—Make a survey of existing local organizations in your community, if any, which aim to advance food conservation; especially find whether an official local organization exists related to the State food committees (inquire at the State capitol) or to the cooperative extension system of the United States Department of Agriculture, and State agricultural college (inquire of extension director, State agricultural college). If a local organization exists, work with it. If no local organization exists, inquire from State officials as to how a local movement for food conservation can best be started. Some points in forming an official local organization are as follows:

(*a*) An official local organization, representing the whole community and all organizations, is desirable, as it can best give the local leadership needed.

(*b*) Learn the official State plans for local organizations and connect from the beginning with the State food committees for food conservation, which are related to the national food administration, Washington, D. C., and with the State extension system of the State agricultural college, which is related to the United States Department of Agriculture.

(*c*) Make sure that the neighborhood food conservation committee with which you associate your own informal food club has the support and approval of the local community or city government's committee for food-conservation work.

(*d*) Do not give publicity to plans until there is progress to report, then use publicity in the widest possible way.

V. Some practical measures to be taken in the local community.

1. A mass meeting of men and women, to which the food administration's general program is presented by a local, or, if possible, visiting speaker; pledge cards to be filled out and sent to the national food administration, Washington, if this has not already been done.

2. A canvass of households by committees of women to secure pledge-card signatures, registration for classes, etc.

3. A series of practical discussion meetings for women at which the individual problems of using more perishable foods, substitutes for wheat, using local foods, canning and drying, etc., are presented, with cooking demonstrations, if possible.

4. A survey of local food supplies as to—

(*a*) Perishable food grown locally, which can be more largely used by local families.

(*b*) Conserving all local food surplus.

(*c*) Reducing the demand for food brought over long distances by railroad transportation.

(*d*) Increasing local food production.

5. If the official food administration announcements do not appear in your local newspapers, the local organization should secure definite space regularly in local newspapers, and reprint official directions of the National food administration, the State food committees, and the State agricultural college extension service.

6. Secure official printed material from State authorities, in quantity, if possible, for distribution in homes; if necessary reprint official directions locally so as to reach every household. Farmers' Bulletins on food are official publications of the United States Department of Agriculture and

can be secured in quantity through your Senator or Representative in Congress; the Department of Agriculture will send to individuals direct on request but can not send out in quantity.

7. Use official posters and placards.

8. If the official directions are not being thrown on the screen of the local "movies" secure the cooperation of proprietors and have the directions so used; speakers may also often be introduced between the reels.

9. In larger communities, secure special committees on food conservation from various commercial groups, such as chambers of commerce, bakers, hotels, and restaurant keepers.

10. Public libraries should emphasize special books and collections of Department of Agriculture bulletins on food and its uses and other popular bulletins issued in your own and other States; public museums should organize food exhibits.

11. Public officials should be enlisted, such as health officers and school officials; and social workers, such as charity workers, visiting, rural, and school nurses; industrial welfare workers; and settlement workers.

12. The work under the local central food committee should be extended where possible to organizations in local churches; to labor unions; to lodges and fraternal orders, especially for women; and to local branches of national societies and organizations of women, which have already generally pledged support to the national food administration.

13. Under some conditions, community business enterprises connected with food conservation may be desirable, such as community canning and drying establishments and community kitchens; but these should not be undertaken without careful study of the situation and the advice of impartial experts.

VI. Sources of information for use of local organizations.

1. The United States Food Administration, Washington, D. C., has been charged by President Wilson with official direction of the movement to enlist universal support in food conservation. It will send its directions through the Federal food commissioner and the home economics director of each State to the official food conservation authorities of that State (address at State capitol).

2. The United States Department of Agriculture, Washington, D. C., issues free Farmers' Bulletins and other publications on food production, conservation, and use in the home. (Free list sent on request.)

3. The woman's committee of the Council of National Defense, Washington, D. C., has a department of food conservation which aids in the distribution of the food administration pledge cards and similar work, and has another department on food production and home economics; each department to have a State chairman to conduct its work in the several States.

4. The United States Children's Bureau of the United States Department of Labor, Washington, D. C., issue bulletins on child care, including children's diet.

5. The United States Bureau of Education of the United States Department of the Interior, Washington, D. C., is ready to advise on the work of schools for food conservation, and school courses in home economics.

6. The United States Public Health Service, Washington, D. C., is ready to advise on health problems of national magnitude, some of which, as pellagra, are related to diet.

7. The extension service of the State agricultural college usually issues bulletins on food, including food conservation; apply to the extension director, State agricultural college, for list of State bulletins.

The publications of the departments of the General Government which will be of especial help in food conservation work are listed herewith.

I. FARMERS' BULLETINS OF THE UNITED STATES DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

Bulletins in this list will be sent free, so long as the supply lasts, on application to any Senator, Representative, or Delegate in Congress, or to the Secretary of Agriculture, Washington, D. C.

34. Meats; Composition and Cooking.
121. Beans, Peas, etc., as Food.
139. Emmer: Grain for Semiarid Regions.
142. Principles of Nutrition and Nutritive Value of Food.
203. Canned Fruits, Preserves, and Jellies.
232. Okra: Its Culture and Uses.
256. Preparation of Vegetables for the Table.
270. Conveniences for the Farm Home.
293. Use of Fruit as Food.
295. Potatoes and Other Root Crops as Food.
298. Food Value of Corn and Corn Products.
375. Care of Food in the Home.
391. Economical Use of Meat in the Home.
413. Care of Milk and Its Use in the Home.
414. Corn Cultivation.
487. Cheese: Economical Uses in the Diet.
526. Mutton and Its Value in the Diet.
535. Sugar and Its Value as Food.
559. Use of Corn, Kafir, and Cowpeas in the Home.
565. Corn Meal as a Food: Ways of Using It.
607. The Farm Kitchen as a Workshop.
653. Honey and Its Use in the Home.
712. School Lunches.
717. Food for Young Children.
771. Homemade Fireless Cookers and Their Use.
807. Bread and Bread Making.
808. How to Select Foods. I. What the Body Needs.
817. How to Select Food. II. Cereal Foods.
837. How to Select Food. III. Protein (in press).
841. Drying Fruits and Vegetables in the Home.
853. Home Canning of Fruits and Vegetables. [Southern States.]

II. PROFESSIONAL PAPERS, UNITED STATES DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

The following bulletins may be procured from the Superintendent of Documents, Government Printing Office, Washington, D. C., by remitting the sum mentioned below. Money should be sent in the form of a postal order.

200. Office of Experiment Stations Bulletin, Course in Cereal Foods and Their Preparation. Price, 10 cents a copy.
123. U. S. Dept. Agr. Extension Course in Vegetable Foods. Price, 10 cents a copy.
467. U. S. Dept. Agr. The Food Value and Uses of Poultry. Price, 5 cents per copy.
468. U. S. Dept. Agr. Potatoes, Sweet Potatoes, and Other Starchy Roots as Food. Price, 5 cents per copy.
469. U. S. Dept. Agr. Fats and Their Economical Use in the Home. Price, 5 cents per copy.
471. U. S. Dept. Agr. Eggs and Their Value as Food. Price, 5 cents per copy.
503. U. S. Dept. Agr. Turnips, Beets, and Other Succulent Roots, and Their Use as Food. Price, 5 cents per copy.

III. UNITED STATES DEPARTMENT OF AGRICULTURE FOOD AND DIET CHARTS.

Set of 15 charts, $1, which may be procured from the Superintendent of Documents, Government Printing Office, Washington, D. C.

IV. UNITED STATES DEPARTMENT OF AGRICULTURE YEARBOOK SEPARATES.

639. Apple Syrup and Concentrated Cider. May be procured from the Superintendent of Documents, Washington, D. C. Price, 5 cents per copy.
646. Selection of Household Equipment. May be procured from the Division of Publications, United States Department of Agriculture, Washington, D. C.

V. UNITED STATES DEPARTMENT OF AGRICULTURE CIRCULARS OF EXTENSION WORK, NORTH AND WEST. Free.

Ext. N. R–17. Corn Club Breakfast Food.
Ext. N. K–9. Water Glass Eggs.
Ext. N.—— Making Jelly with Commercial Pectin.
Lists of commercial firms which sell the following: Home and Club Cooperation Canning Outfits and Devices; Home Evaporators and Driers; Mechanical Seals and Sealers for Tin and Glass; Steamers; Heating Devices, Lifting Crates, etc.; 4-H Brand Labels; Tin Cans, Glass Jars, Earthenware Jars and Rubber Rings; Delivery Containers for Eggs, Vegetables, Dried Food Products, etc.; Parcel Post Egg Containers; Miscellaneous Corrugated Board Containers; Paper Bottles.

UNITED STATES DEPARTMENT OF AGRICULTURE CIRCULARS OF EXTENSION WORK SOUTH. Free.

A–81. Canning, Preserving, Pickling.
A–82. Canning Club and Home Demonstration Work (each State has a bulletin on organization).
A–84. Peppers.
A–88. Drying of Vegetables and Fruits for Home Use.
A–89. Jelly Making.
A–90. Preserving Vegetables by Fermentation.
746. Winter Gardens.
775. Use of Vegetables from Winter Garden.
777. Use of Poultry-Club Products.
785. Bread Making with Wheat Flour Substitutes.
1101. New Fall Vegetables.
List of companies from which canning goods, labels, emblems, and fruit jars can be purchased. (Southern States.)

VI. UNITED STATES CHILDREN'S BUREAU, DEPARTMENT OF LABOR, WASHINGTON, D. C.

I. Bulletins in "Care of Children Series," (sent on request):
  1. Prenatal care.
  2. Infant care.
  3. Child care (in preparation).
II. Press series—Brief Articles for Newspaper Publicity, (sent on application).
  1. Care of Young Children—six articles, three of them on the feeding of children.
  2. Children in War Time.

VII. UNITED STATES BUREAU OF EDUCATION, DEPARTMENT OF THE INTERIOR, WASHINGTON, D. C.

The following will be sent on request:
Circular: "Suggestions for the Conduct of Educational Institutions During the War."
"Home Economics Letters." These were prepared for home economics teachers especially, but they have suggestions also for others.
No. 19. What the Home Economics Teacher Can Do.
No. 20. Economy in Food Courses.
No. 21. High School Food Economics in Practice.
No. 22. A Brief Course in Food Economy for Colleges and Normal Schools.

No. 23. School Sewing for the Red Cross.
No. 24. A Course in Food Economies for the Housekeeker.
No. 25. Service to be Rendered by College and University Home Economics Departments.

VIII. UNITED STATES BUREAU OF FISHERIES, DEPARTMENT OF COMMERCE, WASHINGTON, D. C.

The following will be sent on request:
Economic Circular No. 10; The Tilefish.
Economic Circular No. 11; Canned Salmon.
Economic Circular No. 12; Sea Mussels.
Economic Circular No. 13; Commercial Possibilities of the Goosefish.
Economic Circular No. 18; Oysters.

IX. U. S. BUREAU OF STANDARDS, DEPARTMENT OF COMMERCE, WASHINGTON, D. C.

Economic Circular No. 55; Measurements for the Household (15 cents, from Superintendent of Documents, Government Printing Office, Washington, D. C.

VII. *The service of the schools in food conservation.*

The national food administration is making plans for official cooperation with the public school system in the various States this fall. As the plans take shape, the teachers will be asked by the school authorities to do their particular part in their own schoolrooms. Meantime every teacher may patriotically pledge herself to bring into her teaching, incidental to instruction in language and other subjects, the facts of food conservation, so that the children and their parents may be informed and able to act intelligently.

Each teacher is asked to pass on these suggestions at once to her fellow teachers in teachers' institutes and professional societies. It is urged, where possible, to arrange training groups of teachers to consider the directions for food conservation, and to pass them on, until every teacher is reached. In such connections, and in the schools, each should feel a professional responsibility for seeing that the schools contribute their absolutely essential share to the food conservation movement. Teachers and principals and county and city superintendents are each asked to be ready to aid in the official State school program for food conservation, and if details of the program are delayed in reaching them, they are urged to proceed with local food conservation work in the schools, after authorization by the school authorities. Information should be obtained from the State food committees and the State home economics director and from the extension director of the State agricultural college, who will, of course, aid in every way food conservation work undertaken by the schools.

It is obvious that, as the United States food administration from time to time issues its suggestions, the public school offers one of the most direct avenues into the homes of the country, for probably two-thirds of the homes have children in the schools. Every teacher in cooperating to extend the principles of food conservation will be enlisted in a service that is absolutely essential to the Nation.

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